Smithsonian

January 1989

A glacier pilot buzzes
icy crevasses 6,000 feet up
Mount McKinley (p. 96)

The piano is a Steinway
The crystal is by Baccarat
The books are Easton Press

XXXV

For in the Market-place, one Dusk of Day,
I watch'd the Potter thumping his wet Clay:
And with its all obliterated Tongue
It murmur'd — "Gently, Brother, gently, pray!"

XXXVII

Ah, fill the Cup: — what boots it to repeat
How Time is slipping underneath our Feet:
Unborn To-MORROW, and dead YESTERDAY,
Why fret about them if To-DAY be sweet!

XXXVIII

One Moment in Annihilation's Waste,
One Moment, of the Well of Life to taste —
The Stars are setting and the Caravan
Starts for the Dawn of Nothing — Oh, make haste!

XXXIX

How long, how long, in infinite Pursuit
Of This and That endeavour and dispute?
Better be merry with the fruitful Grape
Than sadden after none, or bitter, Fruit.

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(continued on next page)

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(continued from previous page)

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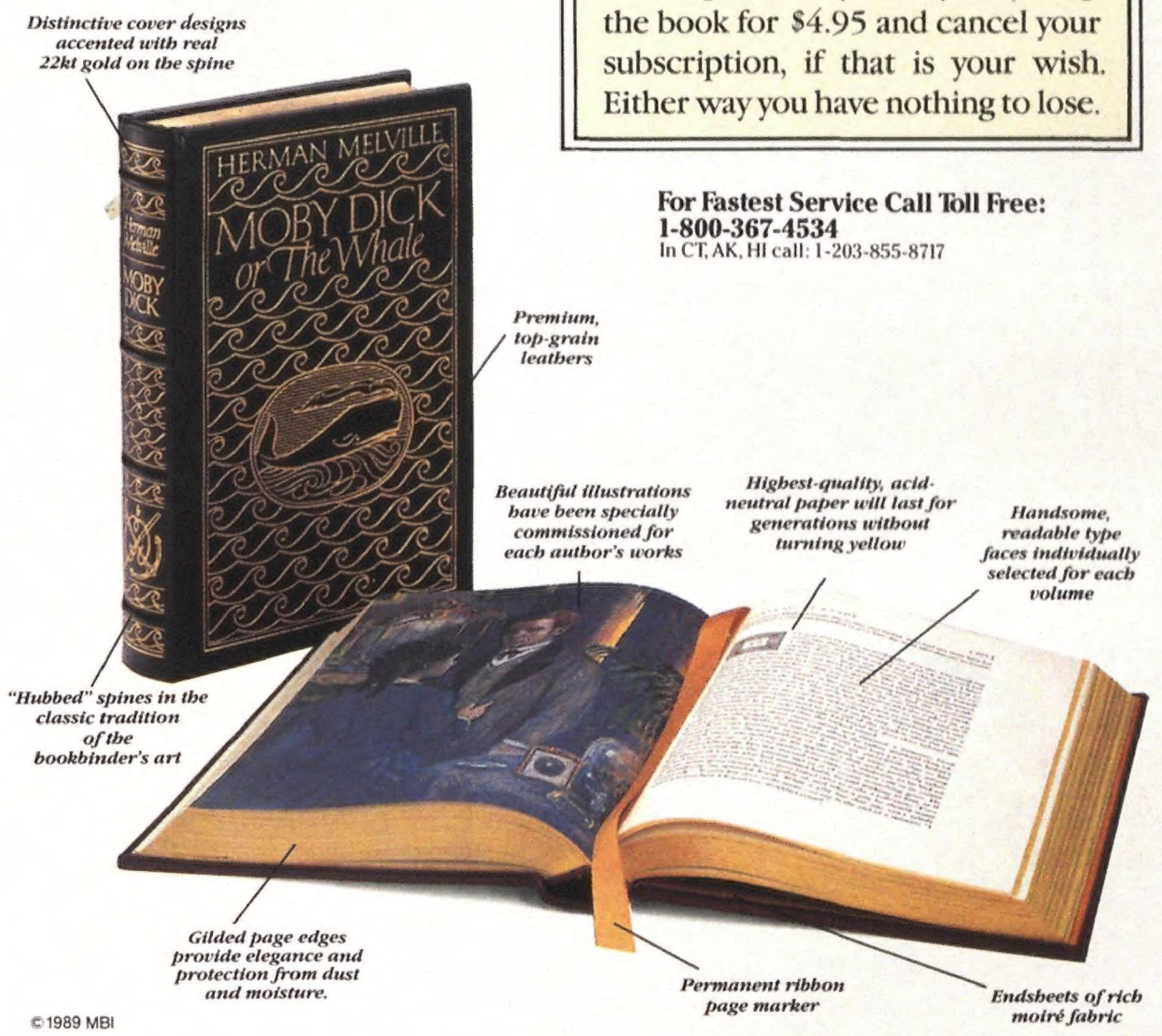
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January 1989

Smithsonian

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create the high flavor notes, the delicate nuances, the fine aromatics in Gevalia.

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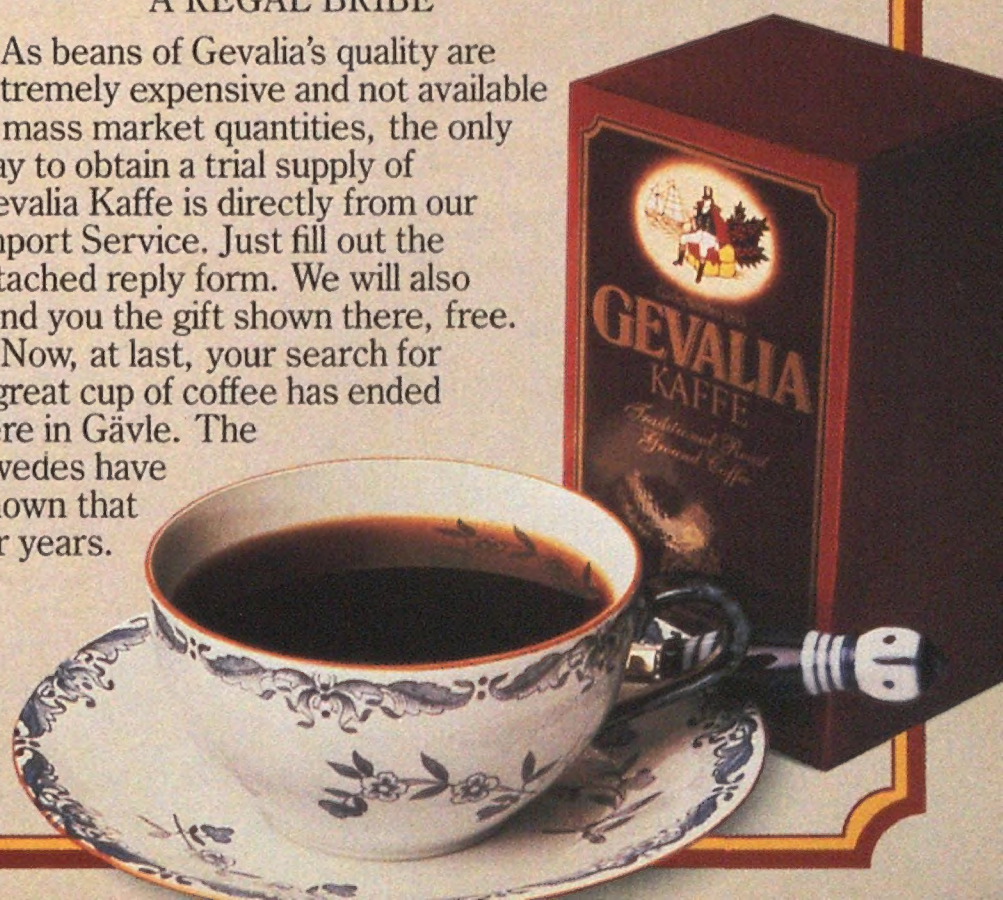

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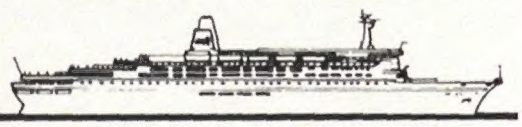

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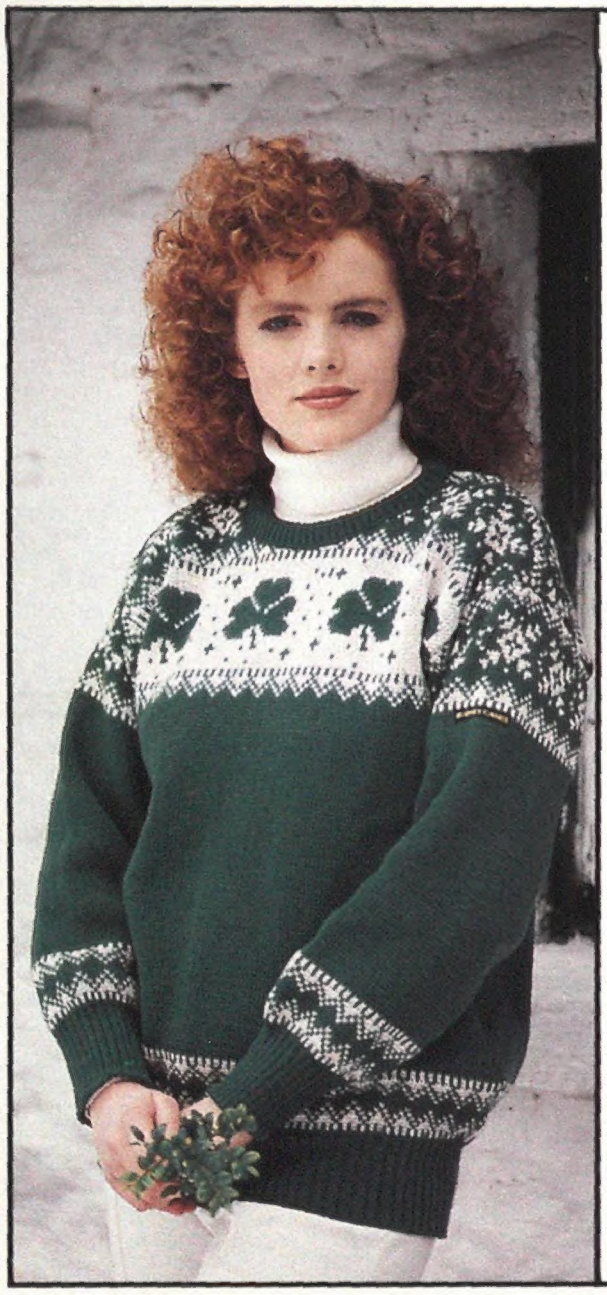

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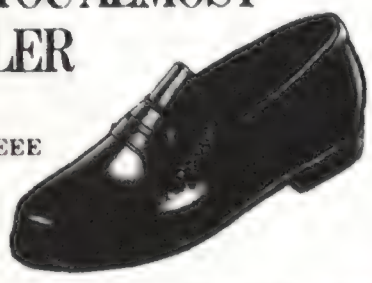

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by David Maass

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Secretary Adams' comments

Smithsonian horizons

A technique originally developed for overcoming human infertility may also help endangered species

Surrogate motherhood is a subject of much ethical and legal controversy these days—as an application of advancing medical technology to specifically human desires or needs. At the National Zoo, Smithsonian specialists in reproductive biology are pioneering another use of the same technology. They are offering assistance, now often desperately needed, in the fight for survival of some of the great wild animals who not so long ago were able to contend with us on more equal terms for a place in the food chain on which all life depends.

In vitro fertilization (IVF), a procedure also increasingly used to help human couples overcome infertility, involves a technique known as laparoscopy. The process usually begins with hormonal injections to stimulate ovarian activity. By directly observing the ovary by means of a narrow-diameter fiber-optic telescope inserted through the abdominal wall, eggs can then be recovered before their natural release. Mixed with the sperm of a male and kept for a time in a culture chamber, those giving evidence of cell division then can be transferred surgically, sometimes even nonsurgically, into a female's reproductive tracts—ordinarily but not necessarily the original donor's.

All this is by now well understood in its application to human beings and to domestic livestock. Zoo animals are another matter. Reproductive difficulties are frequently encountered in them, but have generally been studied as problems focusing on courtship and other behavioral patterns that might be resolved. Particularly in the case of carnivores, expertise—not to speak of medical or financial incentive—has usually been lacking. For some years, however, experimental work guided by David Wildt, reproductive physiologist at the National Zoo, has been directed toward this end. It was not initially conducted on endangered species but on their domestic relatives, household cats.

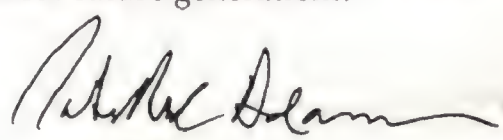
Artificial insemination has met with only limited success in cats, although the propensity of the house cat to breed profusely in human proximity and without human intervention is well attested by any neighborhood bulletin board. It is hoped that, buttressed by some preliminary findings on the diminutive leopard cat, the IVF techniques now successful with this species will be applicable also to more exotic members of the cat family that often have much greater difficulty breeding in captivity. The list includes, for example, the clouded leopard, the cheetah, the flat-headed cat of Sumatra and certain tigers. Males and females of some of these species are frequently incompatible under conditions of captivity, and may seriously injure or kill each other when paired for mating.

The technology has a true conservation potential. In recent months the Zoo's research team has successfully adapted IVF to producing embryos from one larger species of cat, the puma. The incentive for this work is the effort to save the highly endangered Florida panther (a subspecies of puma), whose total number has dwindled to fewer than 25.

The potential advantages of IVF, not merely for zoo management but for species survival, are enormous. Rare, easily frightened animals need not be subjected to the stress of physical transfer from place to place. If the donor female is reproductively unsound, the fertilized embryos may be implanted in a surrogate of the same or a taxonomically related species. And sperm and embryos alike can be frozen and stored indefinitely—possibly even permitting at a future time the reintroduction into the wild of some then-vanished species.

Zoological parks must be seen not only as leisure and educative resources for human visitors, but increasingly also as zones of refuge in which captive breeding programs can be maintained until some sort of sanity is introduced into our relations with our global cohabitants. If we cherish more than a memory of the world as it was before our growing numbers, instruments of destruction and mountains of poisonous debris obliterated so much of it, research like this in zoological parks may hope to carry something forward for our children's children.

Probably many SMITHSONIAN readers are familiar with John McPhee's classic account of contemporary Alaska, *Coming into the Country*. His description of the sparsely settled region along the Yukon, and especially of the subtle, rich and uneasy coexistence of people and grizzly bears, with neither species in a position of uncontested dominance, has etched itself into my memory even though I have never managed to get there. Marginal and perhaps transitory as it is, this shared dominion is the nearest equivalent we have to a living record of how things were during all but the shortest and most recent interval of the immensely longer human career. With a little more help from reproductive biologists and allied specialists, perhaps we can retain the vital symbolism as well as some of the substance of a shared Earth for future generations.



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Letters to the Editor

Snowy egrets

Dear Sir: Your November article put me in mind of last summer. As we took our early morning walks along the Kansas River, my wife and I were fortunate to see both great egrets and snowy egrets. For several weeks we saw increasing numbers of the former. They would fly downstream from the trees where they had perched during the night, landing just below the U.S. Route 59 bridge to feed in the shallows. Later they were joined by snowy egrets.

They sailed high as they came to the bridge, then fluttered down, reminding me of snow blown over an obstacle by the wind, drifting downward in large, fluffy flakes. What a sight!

Bill Atchley
Lawrence, Kansas

Daimyo Japan

Dear Sir: The key to understanding the exhibition of Japanese culture is that the life of the landed gentry, such as the daimyo, with many retainers on hand to take care of material needs, created a major problem of how to fill in time. Parkinson's famous law—that work expands to fill the time available for its completion—also applies to leisure. Thus, in the world of the landed gentry, elaborate costumes were developed for each activity, requiring many time-consuming changes of clothes each day. Meals became lengthy and ceremonious. What did it matter if the tea ceremony took several hours to perform—what else was there to do?

An awareness of the landed gentry's abundant leisure helps explain the form taken by its other cultural activities—the writing of poetry, the study of and pains-

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taking painting from nature, as well as the enjoyment of the length and complexity of Nō drama.
Joy Dunkerley
Washington, D.C.

John Margolies

Dear Sir: History passes before our eyes. Enclosed is my favorite example of a playful drive-through sign [below], the Jack-in-the-Box, once in San Diego.
Nancy Mathews
La Jolla, California

Steinway

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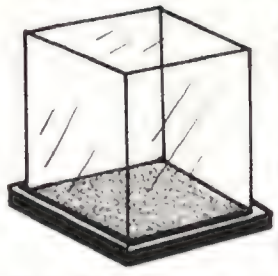

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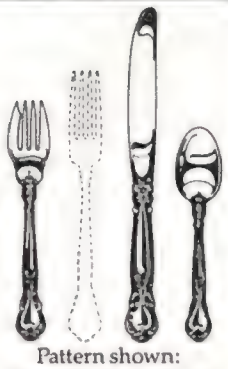

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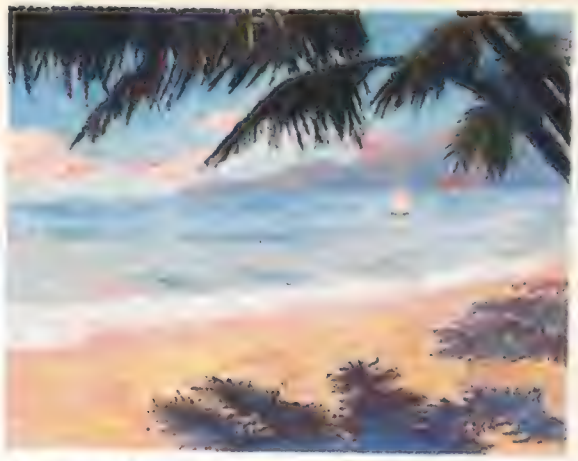

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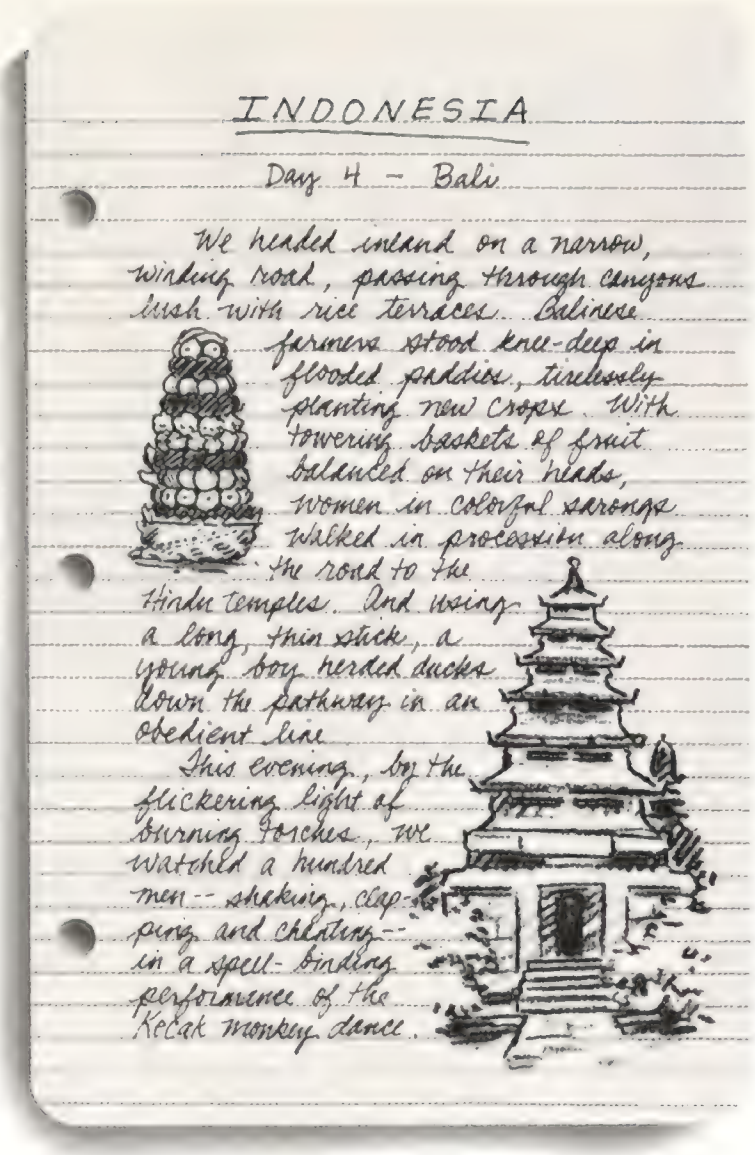
INDONESIA
Day 4 - Bali
We headed inland on a narrow, winding road, passing through canyons lush with rice terraces. Balinese farmers stood knee-deep in flooded paddies, tirelessly planting new crops. With towering baskets of fruit balanced on their heads, women in colorful sarongs walked in procession along the road to the Hindu temples. And using a long, thin stick, a young boy herded ducks down the pathway in an obedient line.
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Bruce A. Stevens
President, Steinway & Sons
Long Island City, New York

Radio mechanics

Dear Sir: The brothers in Jack Fincher's article are errant historians when they call the Buick Skylark "your first American passenger sedan with front-wheel drive."

In the early 1930s, front-wheel-drive Cords skidlessly rounded icy Nebraska street corners.

Skylarks were yet to come.
W. F. Sheeley
Phoenix
Ray Magliozzi tells us he meant, and should have said, the Skylark was the first "popular" American passenger sedan with front-wheel drive. Other "modern" cars, such as the Cadillac El Dorado and Buick Riviera, used it before the Skylark. And cars so equipped even predated the Cord. Ed.

Caving

Dear Sir: I am, as a teacher of caving and other outdoor studies, passionately concerned about the environment and personal safety.

Caving is extremely dangerous. Entrances are vertical pits or steep, muddy slopes. The beautiful sections of most caves lie deep underground, inaccessible to an intrepid explorer in tennis shoes, carrying a flashlight. What will await an explorer so equipped is too often severe injury or death from a fall.

Bacteria, body oils, skin flakes, lint from clothing, food crumbs and all the other inevitables borne by cavers leave indelible imprints on the caves, to say nothing of breakage. In the viewing, we jeopardize the beauty we come to pay homage to; a fist-size cave formation will take a thousand years to grow.

Enjoy caving, but *please* get some information first. The National Speleological Society has chapters throughout the United States. They are at Cave Avenue, Huntsville, Alabama 35810.
Margaret M. Maher
Yucca Valley, California

Joe Louis

Dear Sir: You state that at Joe Louis' funeral there was a 21-gun salute from a military honor guard. At a military funeral, three musket volleys are fired. A 21-gun salute is fired by cannon to

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honor a head of state at official functions. A lesser number of guns are fired for personages of lesser rank.
Ellsworth (Dutch) Nelson
Colorado Springs
Louis was buried with "modified honors," three volleys fired simultaneously by each of seven riflemen—21 shots in all—hence often mistaken for a 21-gun salute. Ed.

Dear Sir: Your article brought to mind a time in the late 1940s when I was emcee of *We the People.* On each broadcast a famous personality appeared to tell some newsworthy incident about himself. Joe Louis was one such guest. Before the show aired, Louis took me aside to inform me that he would be leaving before the conclusion, thanked me for the opportunity to appear and said goodbye. In my tenure as emcee of the program, he was the only one of scores of stars and personalities to extend me that courtesy.
Dwight Weist
New York City

Alfred Nobel

Dear Sir: On page 218 your author speaks of "Baku oilfields in the Crimea." Baku is on the eastern shore of the Caspian Sea, and the Crimean Peninsula is located on the northern shore of the Black Sea, quite far to the west of Baku—a good 700 miles.
Ulrich Weiss
Bethesda, Maryland

Quartz

Dear Sir: The beautiful variety of jasper pictured on page 95 is not found in Utah, but near the bottom of the 800-foot-deep Bruneau River Canyon in Owyhee County, Idaho. Those of us who collect, cut and polish this material refer to it as Bruneau jasper.
M. C. Parker
Lompoc, California

Heteronyms

Dear Sir: Just a minute! Forty-nine entries make a minute list, given the guidelines in Felicia Lamport's column.

The debutante hoped her entrance would entrance the boys, but a row broke out in the first row when she took her bow and her bow fell off.

The retired mechanic retired his car and decided to reside the house where he wanted to reside.

Though he would resent it after he resigned, he resigned and resent the contract, but he had no resolve to resolve the mystery.

New Yorkers go to resorts as a last resort to resort their tangled emotions.
Harvey Minkoff
New York City

Dear Sir: Passing through that foul quagmire, the Slough of Despond, I'd become so filthy I wanted to slough off my clothes.
Carol Baldwin
Chicago

Dear Sir: One who moves big radio antennas would be a tower tower.
Allan D. Pratt
Phoenix

Dear Sir: I considered compiling an extensive list of heteronyms, but decided against the project when I could not project how long it would take.
Keven Frank Danyi
Bethlehem, Pennsylvania

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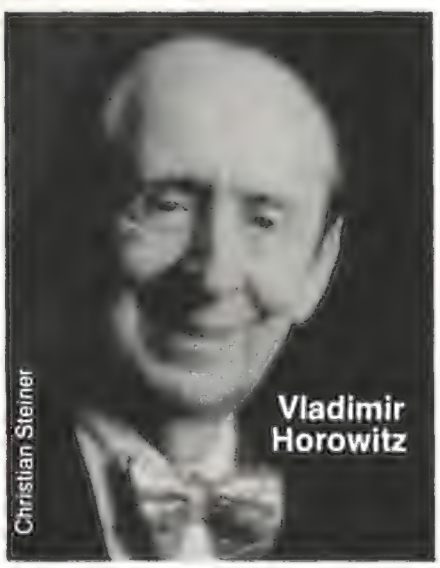

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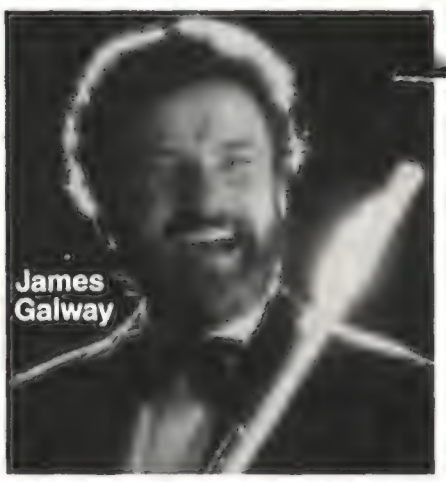

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Around the Mall and beyond

For a few evenings last fall, a lot of people here in Washington thought they were going batty. For suddenly, soon after darkness fell, the round exterior of the Hirshhorn turned into a giant outdoor screen on which three images appeared. Four giant microphones rose below the balcony that overlooks the Mall. On either side of them, a giant hand was splashed against the curved concrete. The hand to the left pointed a revolver straight at you. The other—set off by a matching cuff link—held a candle.

The huge projection stayed on for the evening hours, then vanished at midnight, having by then rammed home its enigmatic statement. Everyone who saw it—Smithsonian visitors trying to find their cars along the Mall, overtime workers hurrying to the Metro station, late joggers intent as ever on achieving their sweat-stained immortality—probably read something different into this display by Polish-born artist Krzysztof Wodiczko. The message I got was that Washington (and maybe America as well) is the home of crime and endless talk, but also of flickering hope for the world.

The other thing that struck me about the projection was that the Hirshhorn, having recently entered its 15th year, is now beginning to use its own strange, circular shape as an accessory to art.

When the gallery rose beside the Arts and Industries Building in the early '70s, the architecture perplexed many Washingtonians. It was so shockingly different from the exuberant Victorianism of that turreted and colorful 1879 museum and from the bland federal offices across the way. People sniffed that it looked like a stone doughnut, a penitentiary, a hockey rink.

The fact is, the Hirshhorn building works beautifully. On its two upper floors, the galleries of paintings, one leading into the next, keep you going around in a circle that seems to end too soon. The inner rings lead you on a similar circular stroll past enticing small sculptures. The lower-level galleries are splendid for special exhibitions. And because the Hirshhorn has proved to be a good museum, even its offbeat exterior has been accepted as part of the Washington scene.

Some may feel they still have to forgive the Hirshhorn building, but nobody can forget it. It's a thick, slightly asymmetrical ring, resting on four huge piers. Most of the ground floor is simply missing. It's an area left open for the display of outdoor sculpture, circling the fountain pool. On the museum's opening night, in October 1974, we danced there—vigorously, because of an unusual cold snap that caused the orchestra to per-

Rounded facade of the Smithsonian's Hirshhorn Museum becomes a giant screen for artist Krzysztof Wodiczko's arresting light show.

At first she thought it was the Golden Alaska Caviar, or the chilled vodka. But when his face took on that ear to ear grin, the one she hadn't seen for a while, she knew it was more.

"Let's get married," he said.

"We're already married," she said.

"Again," he said.

And over Pink Lobster Bisque and Peppered Canneloni they laughed and planned a shipboard wedding.

And when the last morsel of Royal Pheasant was gone, when the Gateau Napoleon had been reduced to crumbs, it was written in stone.

Wednesday morning, on the ssCostaRiviera, somewhere between Grand Cayman and Cozumel, Lido Deck aft, David and Jennie Curland got married again. A waiter, Giovanni D'Angelo, stood up for David. The Chief Purser, Lorenzo Dasso, gave the bride away. And Captain Elio Mandrilli pronounced them man and wife.

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form (so the leader told me) with long woollies underneath their tuxedos.

I sometimes wondered why more of that exterior space wasn't being used for special exhibitions or for work other than sculpture. But gradually it began to be so used, and in this, the Hirshhorn's 15th year, it will continue to be.

A French artist, Daniel Buren, was the first to do an exterior show there. In the spring of 1978, he bedecked the inside of the circular court with banners bright with vertical stripes. These banners were part of a European exhibit that was on view inside.

Last year, Sol Lewitt, a conceptual artist, took further creative liberties with the building by painting a wraparound mural on the walls of the third-floor escalator lobby. He converted the whole space into a fresh and welcome visual "event," launching a new Hirshhorn exhibition series called WORKS. The series was designed to bring "temporary site-specific art" to the museum. Lewitt's brightly colored geometric "wall drawings" were executed in December 1987; after a couple of months they disappeared, a transient episode as tantalizing and impermanent as a sunset.

Then, Hirshhorn watchers will recall, groups of varied building stones were placed on ledges outside the second, third and fourth floors so that they circled the inner court. This was the work of two artists, Kate Ericson and Mel Ziegler, who researched various Washington edifices, then selected samples from the quarries that had produced the stone for those buildings. The samples were "installed" in March, all neatly labeled, and vanished in May—another transitory display, here today, gone tomorrow.

In June, a Texas artist named Vernon Fisher covered the emergency exits (handles, hinges and all) of the inner sculpture gallery with a series of wall paintings generally depicting half-erased blackboards. They gave the impression of interrupted lessons. One blackboard dealt with anatomy: a skull, a rib cage, a femur drawn over the others as if by an impatient professor too absorbed to be bothered with keeping things neat.

Another "board" contained quite a lot of writing, a lesson in radio engineering, which, according to Fisher, gave the "associated visual images significant new layers of meaning." This one taught us something about "ELF," short for Extremely Low Frequency, a system that the Navy uses to communicate with its Trident submarines without their having to risk detection by surfacing. One of ELF's bugs, says the blackboard text, is that its signals are so subtle they require especially sensitive receivers. So sensitive, in fact, the text continues, "that on more than one occasion radio operators have delivered to the decoding center the mistakenly logged records of their own heartbeats."

This information was not made up by the artist; these were matters of fact. Fisher says bits of text make his unrelated images "fall into line." As a writer who has for years been force-fed the notion that a single picture is worth a thousand words (how ridiculous!) I find Fisher refreshing.

Don't look for Fisher's blackboards now, though. The doors have been painted over. Again, this is temporary art. No one can collect it. Instead, it's a show, a drama, put on for the gallery by the artist, working while people watch.

So also with Krzysztof Wodiczko's often highly political light projections. He has done some 40 of them all over the world, setting up batteries of projectors and taking aim at target structures. Trained in Warsaw as an industrial designer, he projects his images on surfaces that may, he feels, require a second look at themselves.

He put a giant eye on the pediment of the Swiss Parliament Building in Bern. Images of the homeless appeared on Boston's Civil War Memorial. He very narrowly escaped being thrown into the pokey for shining a swastika on the facade of the South African Embassy in London. His show at the Hirshhorn was done with five projectors, two superimposed for each hand, one for the microphones. It played for only three nights in October, and then was gone. "Art is being used here not as a product, but as an experience," one of the Hirshhorn people told me, noting my innocent bafflement.

The WORKS series will continue this year. Daniel Buren will be back next month, presumably to punctuate the building with more of his stripes. In March, I was told, another artist, Buster Simpson, will "do something with the fountain in the circular court." And so, apparently, will Houston Conwill next August. No one knows yet just what these two have in mind, but I guess, now approaching its 15th anniversary, the Hirshhorn can take it, whatever it is.

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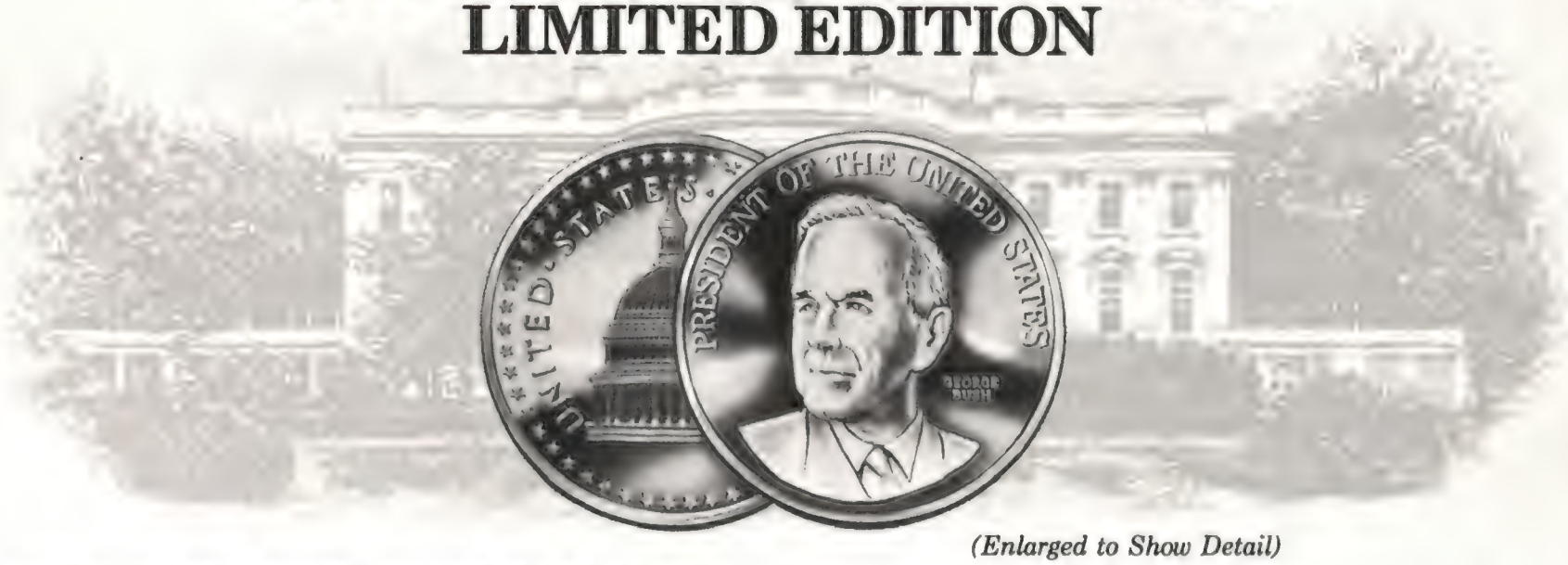

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Book reviews

Fishing With John
Edith Iglauer
Farrar, Straus & Giroux, $19.95

Above the U.S. border near Seattle, the Canadian Pacific coast reaches northward along a jagged, 500-mile fringe of mountains, forests, fjords and islands. The water is cold and often wild; the winds strong enough to blow a lighthouse into the sea. Beyond the towns, it is a world inhabited mostly by fish and wildlife, with a scattering of hardy people—fishermen and loggers, men who "eat and drink like Henry VIII," couples who enjoy the company of wolves, women who carry hunting knives. Hardly a natural habitat for a sophisticated New York writer of late middle age, a longtime contributor to the *New Yorker* magazine. Edith Iglauer had been accustomed to a citified existence drenched in comfort and culture until she turned her life upside down. In 1974 she fell in love, married John Daly, an erudite and poetic 61-year-old salmon fisherman, and moved aboard his boat, the *MoreKelp*.

"I had the idea that from time to time we would go into charming little seaports like the ones I had seen at Cape Cod," Iglauer writes, "and step out for dinner to the small, chic kind of restaurant one finds in summer along the Eastern seaboard of the United States." She brought along a low-necked dinner gown for such evenings, but instead found herself clambering up ladders over oily black pilings just to get ashore at the fish-plant docks in towns where her husband occasionally took her to a Chinese eatery.

Fishing With John is a moving memoir of the years she and Daly spent aboard his 41-foot troller ("the single most uncomfortable fishing boat in British Columbia"). It is a touching book, yet totally unsentimental, and a fine job of reporting—on a little-known part of North America and its beauties, on a harsh but wholesome way of life, on the joys of a late marriage, but mostly on the complex, endless labors of commercial fishing. Here and there it reads like one of Iglauer's *New Yorker* pieces, as conversations with her husband turn into interviews on sea lore.

Edith Iglauer spent her first trip concentrating on not falling overboard. "For God's sake, can't you stop rocking even for a moment and stand still?" she yelled at the boat one morning, and her husband remarked: "Good, good. You'll make an excellent fishwife."

And so she did. She came to love the *MoreKelp* and understand her husband's fascination with fish. "We trollers are the true water gypsies," he told her. "I have my mountains around me, the water, this boat. I have the sun, the wind, the stars, and the marvelous changes. . . . could *anything* be better?"

Daly fished from 12 to 14 hours a day, rain or shine (the lack of sleep and the hours of standing in a cockpit, working hard, make heart attacks common among fishermen). Iglauer was deckhand and cook and scribe, propped on a bunk with her typewriter, wedged against a dishpan for support.

"When you attain the oneness I have with the sea and the mountains, and the B.C. Coast," Daly once had written to her, "you can face anything, and alone, if you have to. This will be my hoped-for gift to you." And a timely gift it was, for in 1978 her husband died, and today she lives alone in the home John Daly fitted out for life ashore.

David Lancashire
Globe and Mail, Toronto

Plain Southern Eating:
From the Reminiscences
of A. L. Tommie Bass, Herbalist
Compiled and edited by John K. Crellin
Duke University Press, $12.95

This little book presents A. L. Tommie Bass, who enjoys some fame throughout the South, having appeared on television and radio, including the Alabama segment of the Turner Network's *Portrait of America.* Bass, 80, lacking a formal education, has spent his life "truck farming and peddling with his father, cutting crossties, trapping and

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The Canadian Government has banned the commercial hunting of whitecoats. Seal Watch '89, organized at the request of the International Fund for Animal Welfare, will attempt to replace any lost income to the communities involved and will help ensure the hunt never starts again. IFAW is an independent, non-profit organization.

SM12

fur dealing, grave digging, plumbing houses, sharpening saws, and selling herbs to individuals and wholesale companies."

John Crellin, an associate professor in the Medical History Program at Duke University, allows Tommie Bass to tell in his own words these reminiscences, recipes, and bits of health and nutritional advice rooted in the Appalachians where he grew up and lives.

Central to this way of life now rapidly disappearing (even Bass relishes a Hardee's biscuit) is corn. Many of the "receipts," as my grandmother would call them, are for corn dishes: hominy, corn silk tea, hoecake, cornmeal mush, mush biscuits, spoon bread, corn on the cob and stewed corn.

I tend to agree with Bass, who feels intuitively that smoked ham, red-eye gravy and eggs are not inherently bad for us; that it's artificial feeds, pesticides, herbicides and other chemicals that create the problem:

"Everyone knew eggs was good for you. Now people are not so sure! The way we keep chickens has also changed. In the old days they let the chickens run out, and they would fence the garden. Now, they fence the chickens and let the garden run out!"

Life comes full circle. Free-range chickens grace gourmet restaurant menus these days. I learned a few new things from these recollections, though. In Bass' day, buttermilk and vinegar served many purposes. Wholesome foods, they ranked highly as medicinals and household cleaners, too. Also printed herein is the formula for Bass Quick Rub, made with camphor gum, turpentine, vinegar, green rubbing alcohol and ammonia—good for bites and rashes like poison ivy.

The charm of *Plain Southern Eating* is in the blend of these evocative and sometimes melancholy memories with Bass' own honest appraisal. He acknowledges the shortcomings, for example, of food "cooked forever" as is often the case with Southern cooking. And he regrets that more folks don't eat Jerusalem artichokes.

In the last third of the book, Crellin considers, in a more scientific vein, food habits of the elderly and the nutritional value of Southern foods. He provides an extensive glossary and bibliographical notes. His opinion is that, over the years, plain Southern cooking, however uneven at times, "given the diversity of

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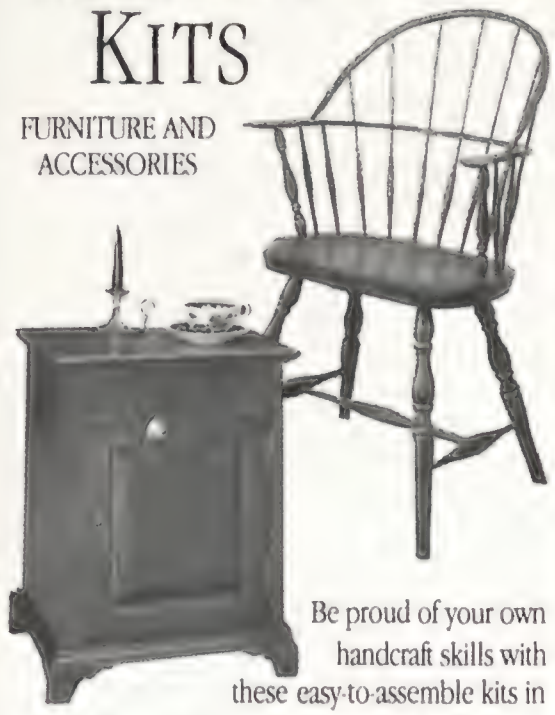

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foraged, bartered, and purchased foods . . . has been balanced and sufficiently nourishing."

Plain Southern Eating is a delightful addition to the growing number and wide range of Southern cookbooks. Some additional recipes found here are for vinegar pie, cobblers, squirrel, rabbit and pickles. Bass also offers descriptions of natural insecticides, planting by astrological signs, hog killings and superstitions.

For A. L. Tommie Bass, "practitioner of the old ways," life's real gift lies in a close and symbiotic relationship with the world. All the old things, indeed, are nearly gone now:

"These days people are always asking me how things have changed. I can't open my mouth and the tape recorder goes. I've told you a big thing is, people don't cook and garden so much like they did in my days. Lots of farmers got to be big farmers, and the little man, you know, went out. Now the big farmer doesn't even raise a garden, and then he claims he is going broke. . . . The farmer's not supposed to be a city man. He is supposed to be with nature."

Jeffrey Beam
Poet, essayist and botanical librarian

Digging Dinosaurs
John R. Horner and James Gorman
Workman, $17.95

If you want to find baby dinosaurs, "you have to be out looking, you have to know what you're looking for, and you have to be lucky."

That is Jack Horner's recipe for the most revealing dinosaur discoveries of the last decade, his own. Thanks to television and print stories galore about Horner and his work—even a delightful children's book by these authors, *Maia: A Dinosaur Grows Up*—any 7-year-old can tell you, as mine gladly will, that some dinosaurs lived in herds, nested in colonies and provided extended care for their nestlings.

But before reporters discovered Horner, and Horner discovered dinosaur nest sites a decade ago in the western Montana badlands of his youth, none of these complex dinosaur behaviors was known. And outside of technical literature, the larger evolutionary dimensions of Horner's pioneering work—which demonstrates how species of Montana dinosaurs may have come and gone in response to wholesale environmental changes—had not been limned.

Now, in this slim yet satisfying chronicle, Horner and his Watson, former *Discover* magazine columnist James Gorman, have given us the facts (at least up to the 1988 field season) in a clear case of Sherlockian deduction. This is one man's account of how he looks for dinosaurs, and why he's found so many and learned so much about them.

Horner found his first dinosaur fossil when he was a small child and he has willingly studied nothing else since. He is a scientist who has reached his 40s without earning an advanced degree (some of the requirements simply went unfulfilled), yet enjoys the high regard of fellow paleontologists for his scrupulously conservative approach and his respect for the science.

Horner characteristically stresses the serendipitous aspect of his finds, beginning with a coffee can full of juvenile duckbill dinosaur bones given him by the owner of a Montana rock shop. He makes no bones about his own financial naiveté. As he notes here, he made his first grant proposal to the brewer of his favorite beer, Rainier. That free-lance inquiry did not sit well with his then employer, Princeton University. He disparages his own scientific mind, describing it as the "hunt, poke and dig around version usually issued to field scientists."

As Horner pieces together the fragments of his dinosaur puzzle, it is apparent he has approached his objective—bringing the details of the duckbill dinosaur lifestyle to light—with rare patience and insight. He's done his homework, studying the theories and mechanisms of speciation. And he's done his fieldwork, too, reading between the geological lines of Montana's Two Medicine formation as he's walked and crawled it, scrounging on hands and knees for telltale bits of bone and eggshell.

"One of the odd things about paleontology is that you can find *one* of anything almost anywhere," writes Horner of his distinctive finds. If you are Jack Horner you can find far more. Before his research few juvenile dinosaur bones were known anywhere, and neither whole eggs nor embryos had been found in North America. He's unearthed hundreds of juveniles and tens of eggs, several with embryos. Peruse his one account for the lay reader, and you will understand why he is so successful at digging dinosaurs.

Don Lessem
Massachusetts writer and editor

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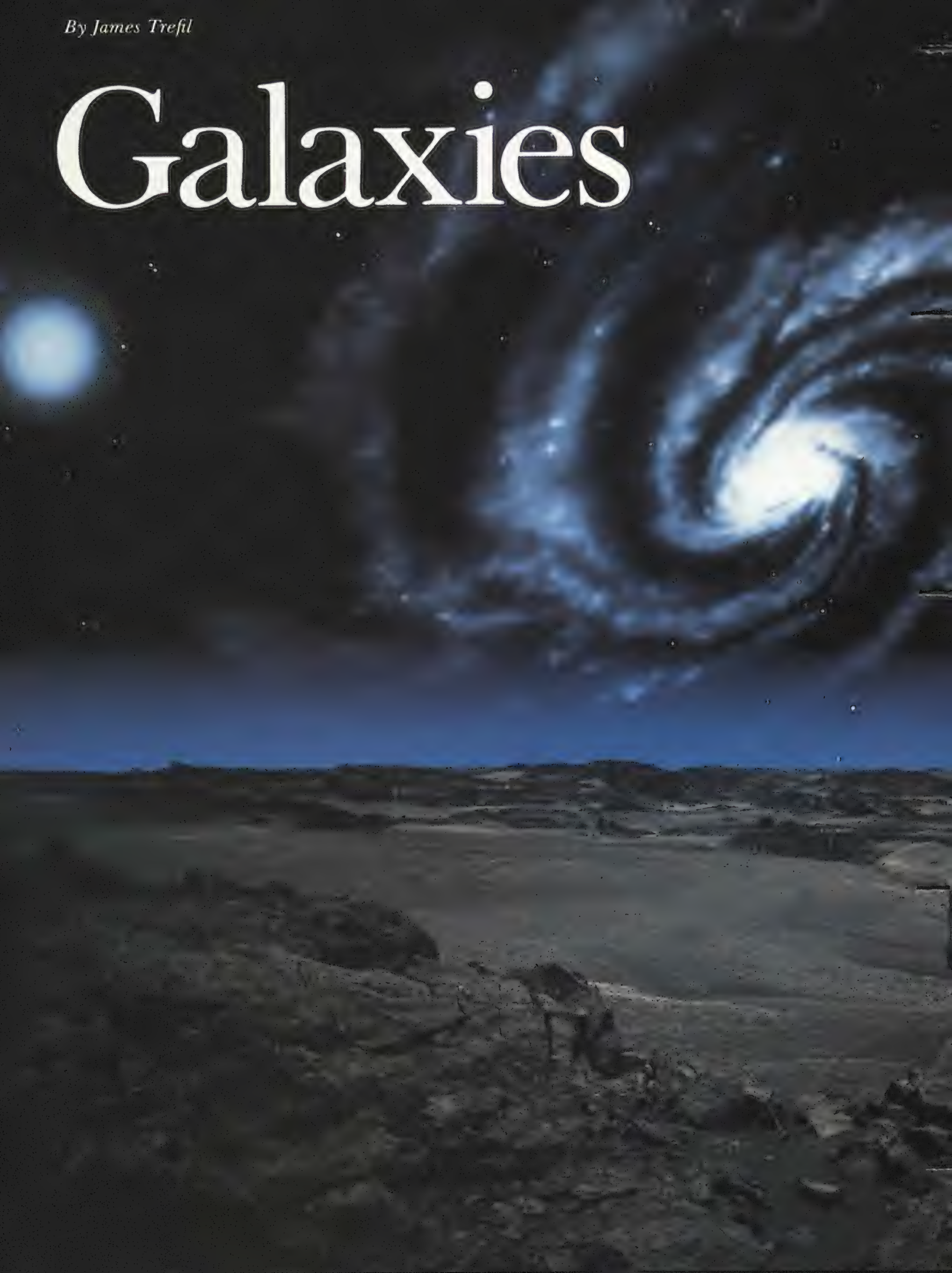
By James Trefil

Galaxies



Scientists are discovering mysteries and marvels as they probe these huge building blocks of the Universe

If you are lucky enough, on a moonless night, to be under a truly dark sky in the desert or the mountains, far from the light pollution of the cities, the spectacle overhead is awesome: a river of stars seemingly without number, stretching from horizon to horizon. This great celestial spectacle is the Milky Way, the galaxy that is our home. Looking into the night sky from the Northern Hemisphere, even at the darkest hour of the darkest night, everything that the unaided human eye can see—everything but a galactic neighbor or two—is a part of our home galaxy. For most of recorded history, and until surprisingly recently, for all practical purposes it has been: the Universe.

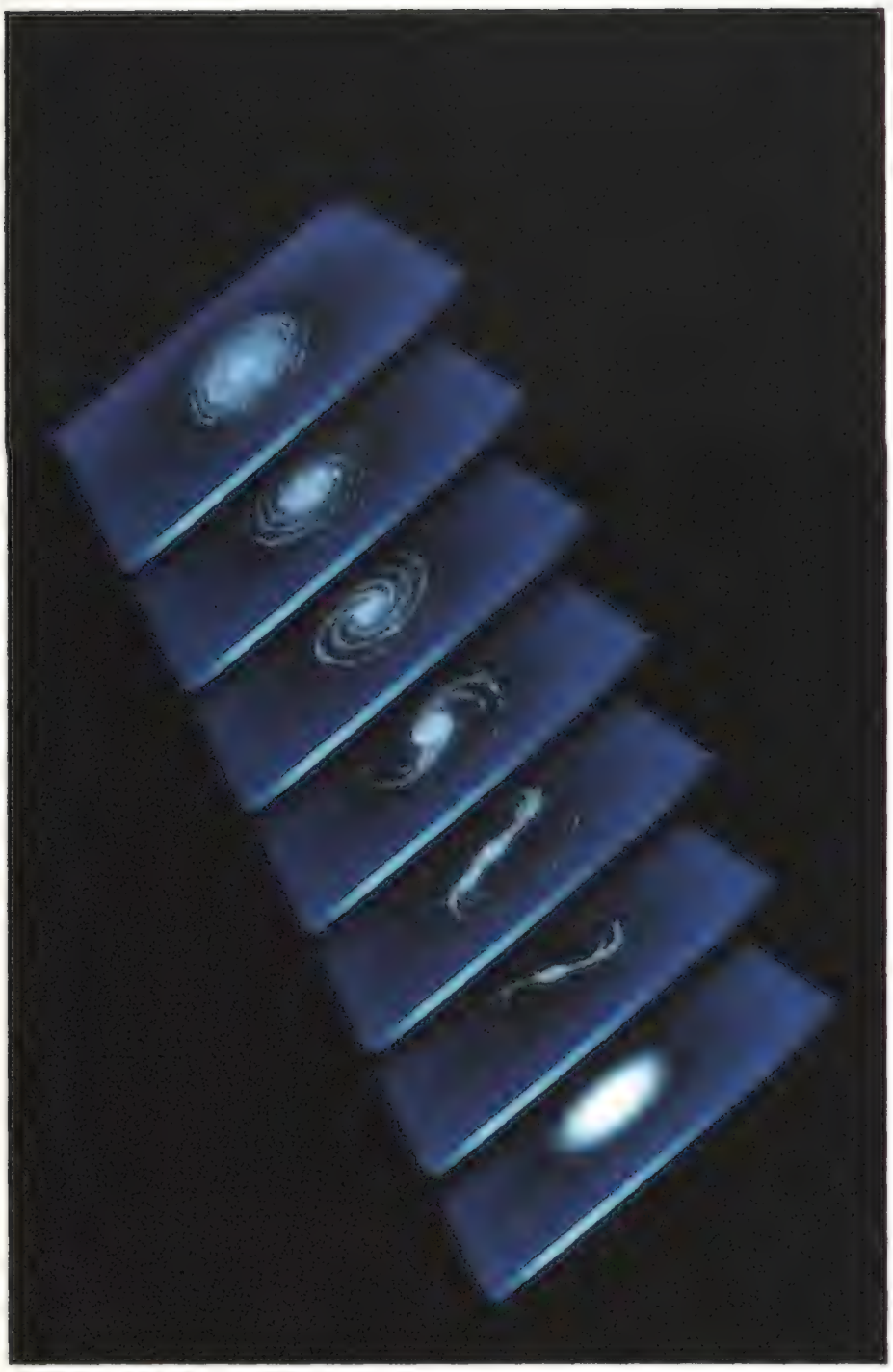
We now know, of course, that the Universe is designed on a scale far more grand. The Milky Way is but one of billions of galaxies that populate it, some of them far larger than our own. The science of understanding them, a science not yet 70 years old, is today a field of feverish activity. With giant telescopes that look deep into space (SMITHSONIAN, June 1987), with infrared and radio instruments that can peer through obscuring clouds of dust, with microwaves to detect such surprising formations as molecular clouds containing formaldehyde and ethyl alcohol, with spectroscopes and radio interferometers that measure the twists and curls of magnetic fields, researchers are probing the heavens for answers. Close in, they are looking at our own galaxy and its near neighbors. Far out, they are probing at such remote ranges that some of the light now reaching their telescopes left its galaxy almost 15 billion years ago.

It is a world of black holes and dark matter, of tight balls of stars where a hundred thousand suns jostle for room, of unimaginable forces as well as distances. In it giant structures seem to be connected almost architecturally to form still larger structures, which in turn connect in an organized way to form the known Universe.

As recently as the beginning of this century, astronomers had only rough ideas of the size and shape of our home galaxy and where we are situated in it. They speculated about the existence of other galaxies in the Universe, of course. And when larger telescopes came into use, they found that some of the distant blurry

Our own galaxy, the Milky Way, with globular cluster (left), gleams in sky of imaginary planet near its fringes.

Photographs by Michael Freeman



Even "regular" galaxies, as illustrated here, exhibit considerable variation. They fall into three classes: ordinary spirals (the first four from top), barred spirals (next two) and (finally) an elliptical galaxy.

objects they called nebulae (in Latin *nebula* means "fog" or "mist") were in fact large clouds of gas, excited to the point of glowing (like a neon sign) by the energy of hot young stars within them. These nebulae were clearly inside the Milky Way; indeed, we now think of them as regions where newborn stars are flaring up as they form from interstellar gas and dust. Even with the most powerful existing telescopes, however, a number of these nebulae still looked like cloudy patches of light. Astronomers were bitterly divided on the question of whether any of these could actually be other galaxies, far from our own.

The argument could not be resolved until we determined how far the Milky Way galaxy extends into space. Because the distances are so immense, it is not simple to establish how far it is to any object in the sky. Is a star bright because it is close, or is it so intrinsically bright that it appears bright in our sky even though it is very far away?

The answers came out of the painstaking work of Henrietta Leavitt, an astronomer at Harvard in the early years of this century. She spent thousands of hours scanning photographic plates of the Southern sky, looking for variable stars: those that brighten and/or dim over time. Among the places she looked were the Magellanic Clouds, two wispy spots that we now realize are satellite galaxies to our own—in one of which, in 1987, the brightest supernova in 300 years blazed forth (SMITHSONIAN, April 1988). One class of variable stars is known as Cepheid variables, after the constellation in which the first one was found. Their light varies regularly, brightening and then dimming over the course of a few months, weeks or even days. Leavitt found a direct correlation between their true (as opposed to apparent) luminosity and the length of these brightening and dimming cycles. A Cepheid with a certain time cycle (or period) always had a certain true brightness.

Through the clouds in Sagittarius

Suddenly astronomers had a yardstick. Any place they found a Cepheid, they could tell its average true brightness from its period. Then, by comparing it with the star's average apparent brightness, they could calculate how far away it was. Beginning around 1915, Harlow Shapley used stars similar to Cepheids to measure distances to the globular clusters of stars that lie in a spherical configuration around the central spiral of our galaxy. He plotted them, and reasoned that the center of the sphere must be the center of our galaxy, which he placed (correctly) on the other side of the star clouds in the constellation Sagittarius. Once again the Earth found itself displaced from the center of things. Just as Copernicus demonstrated in his publication of

Galaxy models demonstrate "redshift" by which Hubble proved Universe is expanding. He knew light from receding galaxies "shifts" toward red end of spectrum—the redder the light, the faster the galaxy is moving away. Since farthest galaxies (center) are reddest, and are receding fastest, Universe must be expanding.

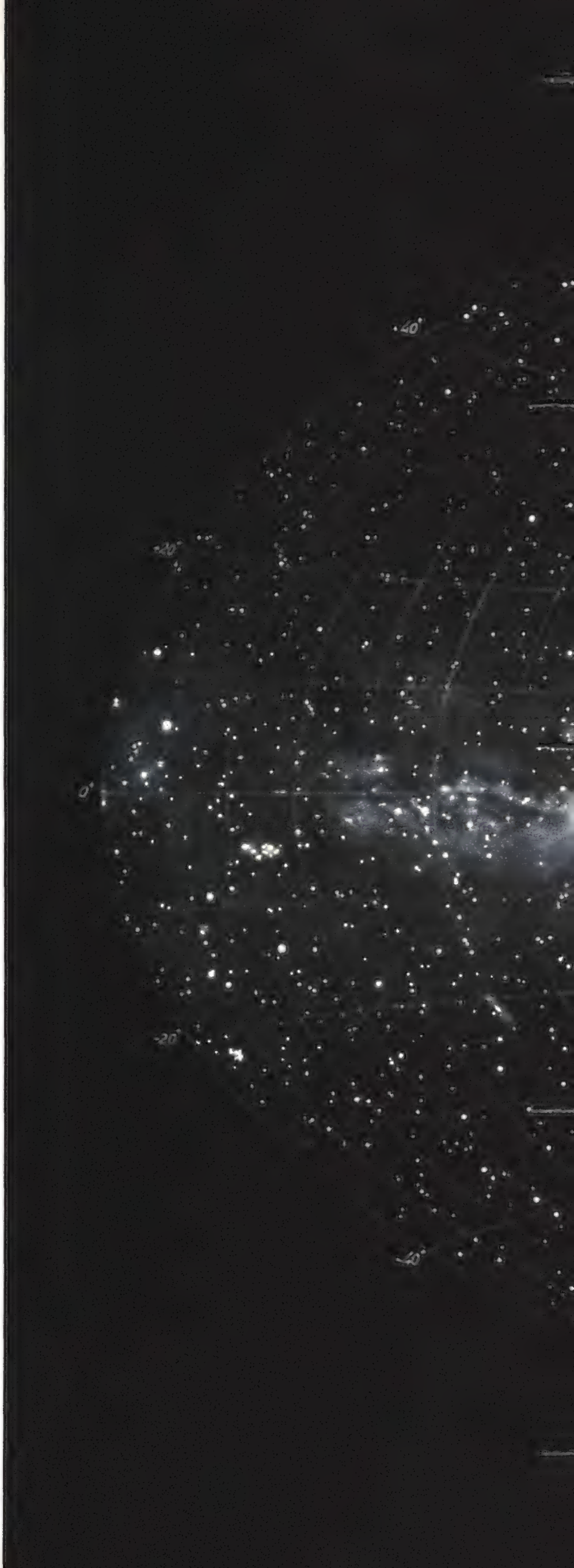
1543 that Earth revolved around the Sun instead of vice versa, Shapley showed us that Earth is nowhere near the center of the galaxy we live in. Worse was to come in the next few years.

As it happened Shapley overestimated his distances, ending up with a home galaxy roughly 300,000 light-years across, more than three times what has since been established as the actual dimension that can be detected by our instruments. Though he did admit the possibility of other galaxies, he assumed they would be less important than ours, mere satellites in fact. For Shapley, our galaxy was still the main feature of the Universe. This view was not to last. Edwin Hubble, a boxer, Rhodes scholar, Kentucky lawyer and war veteran, as well as astronomer, announced his discovery of Cepheids in the great Andromeda "nebula" (p. 43) in 1924. He estimated its distance at about 900,000 light-years (less than half its actual distance), much too far to be part even of Shapley's overestimated Milky Way galaxy.

Hubble found Cepheids in other "nebulae" (today read "galaxies") that proved to be at greater distances. There was no doubt about it: our galaxy was only one of many. The Universe was larger than anyone had ever dared dream.

In opening up the frontiers of extragalactic astronomy, Hubble became the first to classify the different galaxies he saw into four main types. His system formed the basis for classifications currently in use. Galaxies with no consistent shape were simply dubbed irregulars. The other three types (p. 38), all regular galaxies with distinguishable features, are known as ellipticals, ordinary spirals and barred spirals. The predominant visible feature of ellipticals is that they are round (varying from circles to flattened ovals) and have smooth gradations in luminosity. Both types of spirals are disk galaxies, taking the form when viewed from the side, as one writer put it, of two fried eggs placed back to back (p. 43). Their most visible, luminous parts are the central bulge, or nucleus, and the arms, which trail in curves from the nucleus on ordinary spirals and from a luminous bar that extends through the nucleus on the barred spirals.

For these discoveries alone, Hubble would be immortal. But he would make another of equally cosmic proportions. By 1917 Vesto Slipher, working at the Lowell Observatory in Flagstaff, Arizona, had discovered that the light coming from 21 spiral "nebulae"



Map drawn from multiple photographs shows whole sphere of stars visible from Earth. The white band of clouds and stars is disk of Milky Way, seen here in cross section. We can only see a fraction of our galaxy.

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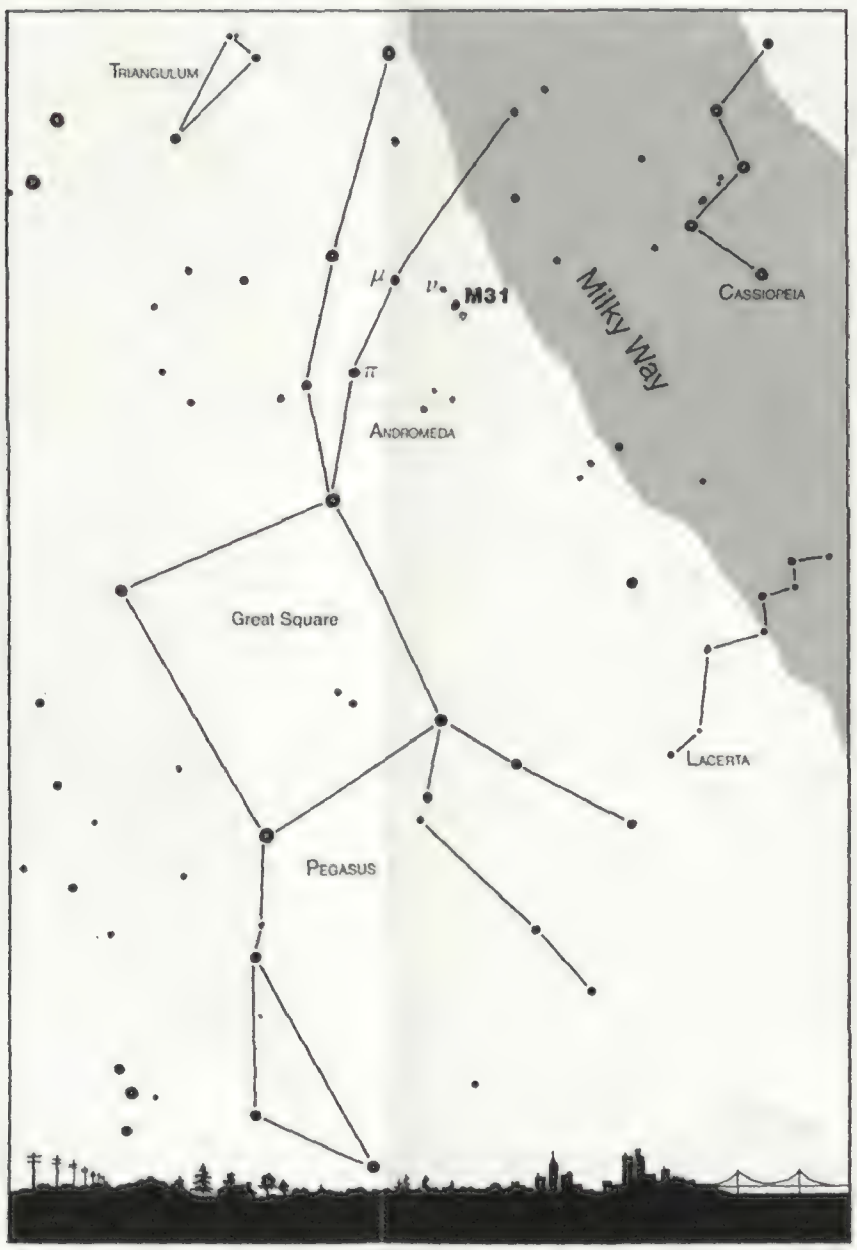
The Sombrero galaxy, about 44 million light-years away, is representative of how most spiral galaxies look from the side. Bulge contains large, old stars, while hot, young stars are in the Sombrero's "brim."



Map shows how to locate M31, the Andromeda galaxy (at right), this month. It can be spotted with naked eye when Milky Way is clearly visible. In midmonth, stargazers should look west at around 8 P.M. to find Great Square of Pegasus. From there, scan up the right branch of Andromeda. M31 appears as a fuzzy spot.

George East

← **Fold out**

was shifted toward the red end of the light spectrum, and such a "redshift," it had been established, meant that these objects were moving away at speeds that could exceed two million miles per hour (p. 39).

Hubble was able to find Cepheid variables in these remote, moving objects and thus measure their distance. He found that the farther away an object was, the faster it was receding. By 1929 Hubble had made the momentous discovery that everything is flying away from everything else: in short, however large it may be, the Universe is constantly expanding.

Today, just 60 years later, all this has a familiar ring to it. People in general know that stars and other heavenly bodies are not randomly distributed across space but are clumped together in galaxies, 100 billion of them or more. Yet in just the past few years a series of jolting discoveries has let us see how many new mysteries remain, how much more there is still to learn.

First, we have come to realize that a galaxy as most people picture it—that splash of luminosity in the darkness of space—is only the visible kernel of a far larger entity. The bulk of any galaxy, it turns out, lies not in stars and clouds of dust but in mysterious dark matter, stuff we have never seen and whose composition remains unknown.

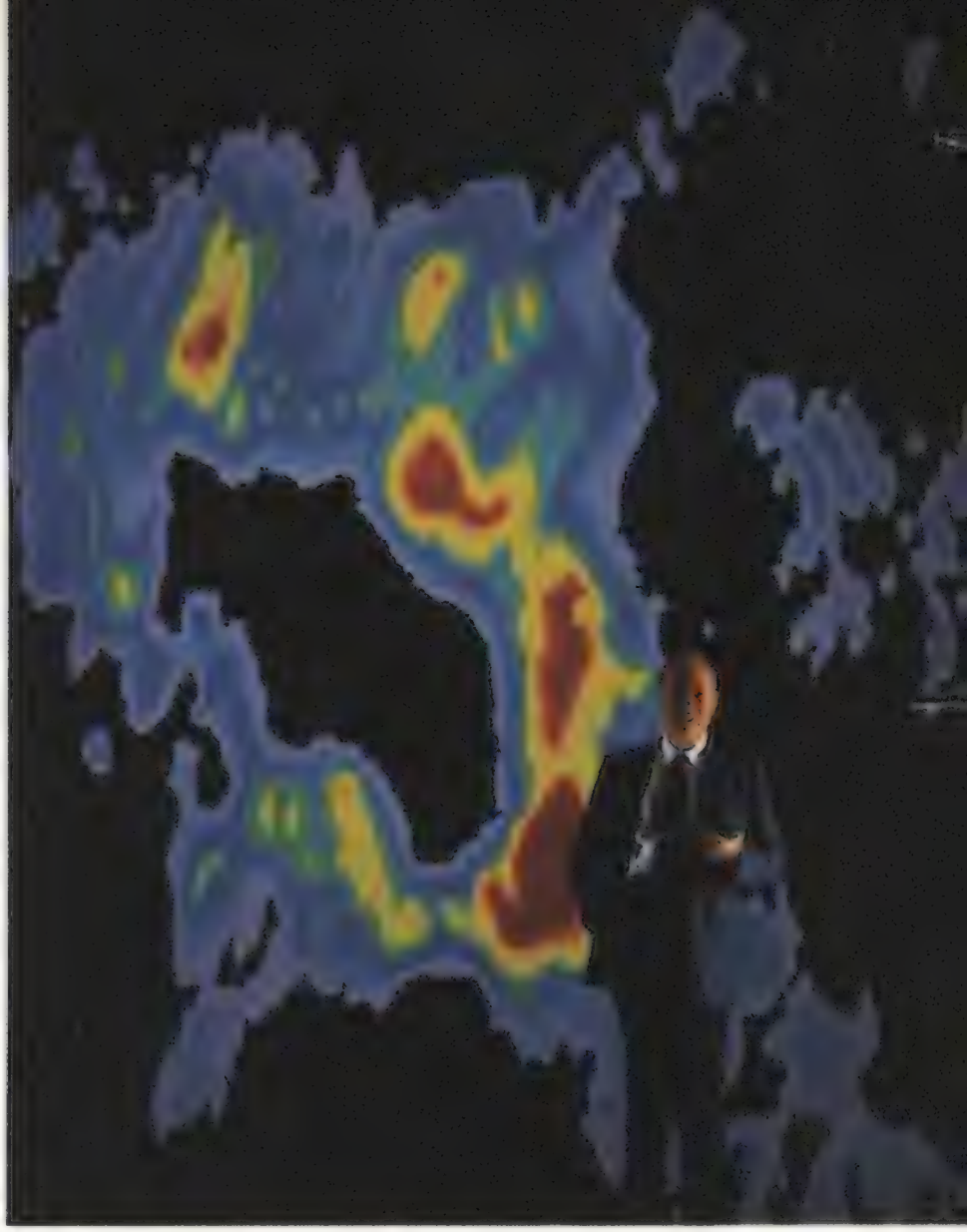
Second, we have found that galaxies may be grouped as though on the surfaces of unimaginably large bubbles, each a somewhat spherical region larger than we once thought the whole Universe to be. Within the bubbles are voids, where almost no galaxies are to be seen (p. 48). A cross section taken in any part of the known Universe, it seems, could look much like a magnified, small cross section of a froth of soapsuds. Why this is so is a question no one has yet even begun to answer.

After decades of speculation, in fact, we have started to penetrate to the very center of our own galaxy. There past the swirling star clouds in the constellation Sagittarius we have discovered a place where stars fill the sky (p. 53), where a huge void may mark a very recent (astronomically speaking) explosion, where enormous clouds of molecules and filaments of matter whirl around a core (above) many believe to be a massive black hole (a point in space with the mass of a million suns). It is a place as different from our part of the galaxy as Times Square on Saturday night is from a salt marsh at sunrise.

Indeed, as we began to realize with the maturation of radio astronomy after World War II, many galaxies, unlike the Milky Way, seem to be places where violence reigns. Galaxies that seemed to be small and insignificant, when compared at visible wavelengths with their neighbors, turned out to be powerful emitters of radio waves. Some of those most powerful as radio sources appear to be galaxies whose centers are still being torn by titanic explosions as they spew out jets of hot matter. The discovery of these "active" galaxies taught us that the rest of the Universe may not be at all like our particular part of the Milky Way, where stars glide through space in a serene Newtonian dance.

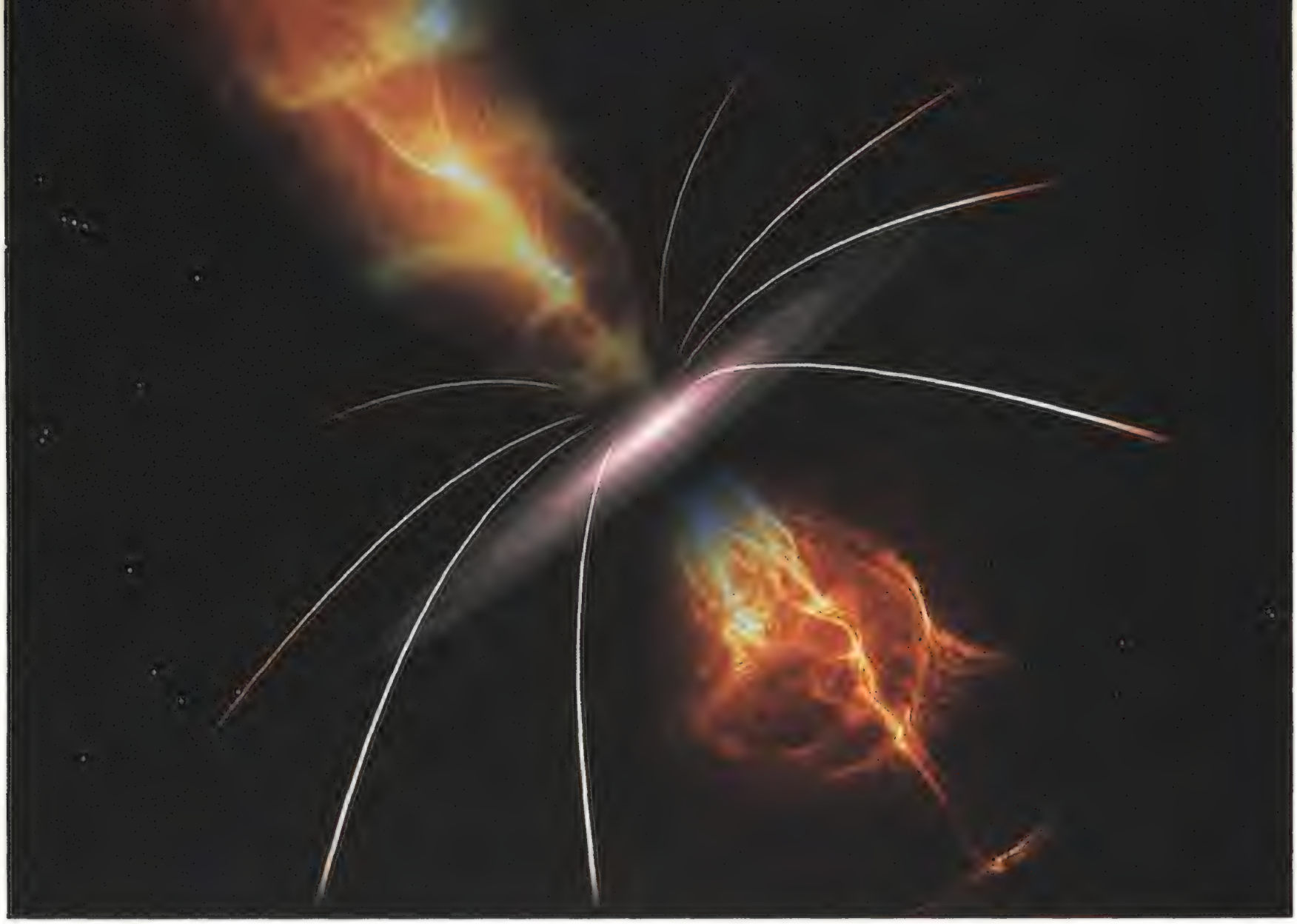
Perhaps the most violent galaxies are the quasars (the name is an acronym for "quasi-stellar radio sources"), radio emitters that look like faint, fuzzy stars. They are the most distant objects in the known Universe; that we can detect them at all means they must be emitting truly enormous amounts of energy, 10,000 or more times that emitted by a familiar galaxy like the Milky Way. In less than a second a quasar can emit more energy than the Sun has given off during its entire 4.5-billion-year lifetime.

What could possibly produce such prodigious quantities of energy? The largest thinkable thermonuclear reactions are too small; the only thing we can imagine is a supermassive black hole with large amounts of matter falling into it. A black hole is what is left when



Charles Townes is dwarfed by microwave map of our galaxy's core. Molecular clouds (in violet ring) orbit central (black) cavity, which likely contains black hole.

Physicist James Trefil's latest book, The Dark Side of the Universe, *was published last year. He wrote for* SMITHSONIAN *on Percival Lowell (January 1988).*



In photographer's view, invisible black hole at center of quasar is evidenced by whirling disk of gas and dust that are being sucked into hole, and by emission of incredible energy (skeins of light). Hole's great gravitational pull progressively distorts space, time, the closer anything gets, as shown by curved lines.

a supergiant star collapses in on itself so completely that only a point, a speck of infinite density, is left. For a good distance around this speck, the gravitational field is so unimaginably strong that nothing, not even light, can escape its pull. Because this region is invisible to the rest of the Universe, it is known as a black hole. Though invisible, black holes can be detected, both by their gravitational effects on stars in orbit around them and by the amount of radiation emitted by the gas being sucked into them (above): the gas is compressed as it falls inward, and becomes hot enough to emit x rays. (Anyone who has used a bicycle pump knows that compressing air heats it; the air in the tire becomes warmer as the tire reaches maximum pressure.)

Whatever the source of a quasar's energy, one fact is clear. When we look at a quasar from 12 billion to almost 15 billion light-years away, we are seeing it as it was when the light waves and radio waves were emitted that many billions of years ago. This means that we are seeing it as it was very soon after the formation of the Universe. Some astronomers suggest that quasars mark an early stage in the evolution of all galaxies—that even sedate galaxies like the Milky Way had a violent beginning in the distant past. If by some miracle we could see one of those distant quasars as it actually is today, we might very well see a galaxy much like our own. And who knows? Astronomers billions of light-years away may be looking at us and scratching their heads as they try to figure out the energy sources of the Milky Way quasar, our galaxy in its youth.

The problem with studying other galaxies is that they are all so far away. The closest major galaxy, the Andromeda, is more than two million light-years away. It is big enough and bright enough, however, that on a really dark night a sharp-eyed person can just make it out (p. 43) as a faint, fuzzy object in the sky.

Like charity, the study of galaxies begins at home. Scientists do not really know how, in the early stages of the Big Bang, "clumps" of matter became dense enough to precipitate out as galaxies. But we do think that when the Milky Way first condensed out of the primordial gas 15 billion years ago (give or take a few billion), it was mostly composed of hydrogen and helium gas. Only small amounts, if any, of the now-familiar chemical elements—iron, aluminum, gold—were around then. Inside the Milky Way, smaller, denser concentrations of hydrogen and helium condensed into stars; and deep inside these stars nuclear

At the CfA, Christine Jones studies x-ray map of a galaxy (inset) to learn about "dark matter" around it.

Light sphere represents all we can "see" of a galaxy that also includes unseen dark matter (in purple).

reactions started to convert the raw gases into heavy elements. Some of these stars were very large, much larger than the Sun, and burned up in a few million years. When they ran out of fuel they exploded, spewing their contents—including the products of all the nuclear reactions—back out into the parent cloud of primordial gas. As new stars formed from this cloud, they incorporated the enriched material and added to it. Thus, as time went by, the quantities of heavy elements in the galaxy slowly increased. By the time the Sun and Earth formed about 5 billion years ago, appreciable amounts of all the elements were available for incorporation. Every atom of iron in your blood, of carbon in your tissues and of calcium in your bones was made in a star that died long before the Earth existed. A galaxy, then, is not a static museum of stars but a changing, evolving conglomeration where stars are born and stars die in a cycle of creation and destruction that lasts for eons.

Despite all the dust and debris swirling among the stars, we have put together quite a good picture of the Milky Way. Suppose for a minute there are astronauts based on a planet in the Andromeda galaxy, preparing for a trip to the Milky Way. When they look up at the Milky Way from their home, they see only the luminous arms of an ordinary spiral galaxy—really a large, dark disk that, at the distance of our Sun from its center, rotates once every 230 million years. The shape of the visible galaxy seen from the side essentially is that of a warped record with a bulge in the middle. As with other ordinary spirals, the greatest concentration of stars is in the nucleus. The Sun and Earth are about two-thirds of the way out one of the glowing spiral arms, in a rather mundane region where, from an astronomer's point of view, there's not a lot of action.

Spiral arms and stellar traffic jams

Pretty as they are, the spiral arms are more apparent than real. Some famous spiral galaxies bear nicknames like the Pinwheel and the Whirlpool, suggesting rapid rotary motion that twists matter into a spiral shape. But galaxies follow the laws of orbital mechanics, much as the planets of our solar system do. Those objects closest to the center complete an orbit the fastest, those farther out orbit more slowly. If the spiral arms were "real," they would have wrapped around the center long ago. We now believe that the spiral arms are simply regions of the galaxy that happen to be much brighter than the rest, the result of waves of greater density moving around the plane of the galaxy. Though astronomers have been able to detect the effects of the waves, they are unsure of how they originated. The waves rotate with the galaxy, but more slowly than the stars and clouds of gas and dust. The resulting effect

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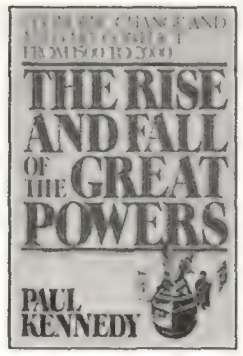

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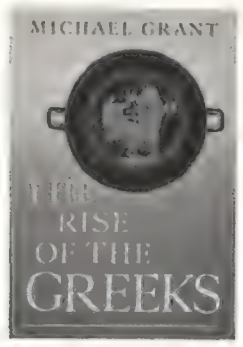

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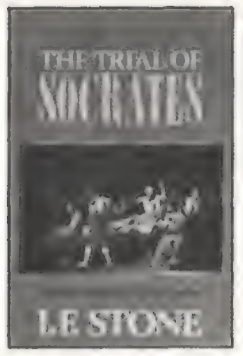

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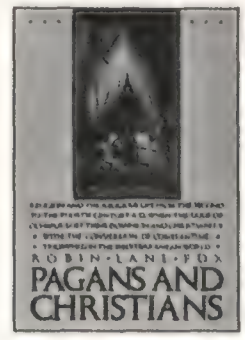

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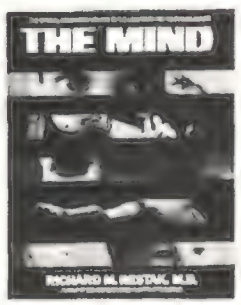

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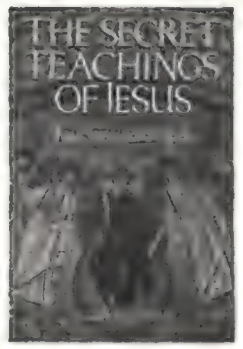

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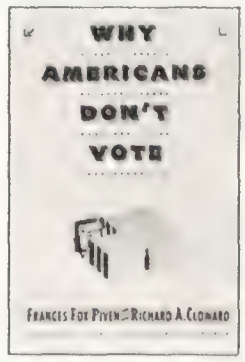

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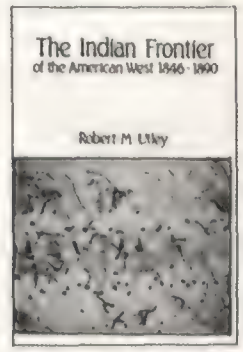

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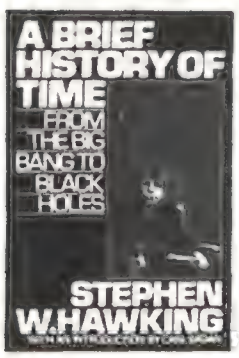

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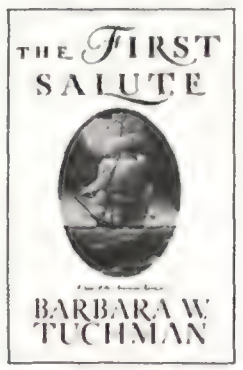

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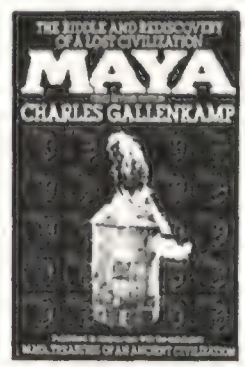

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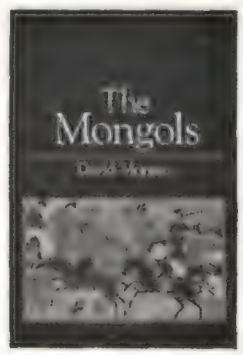

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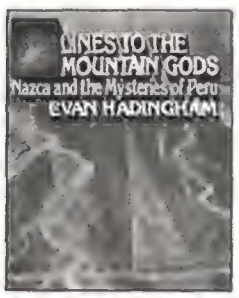

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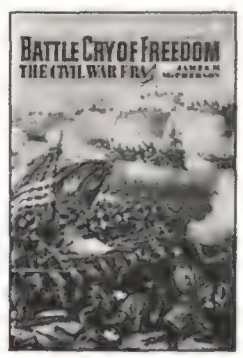

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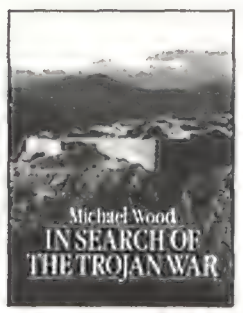

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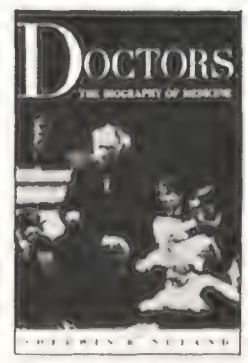

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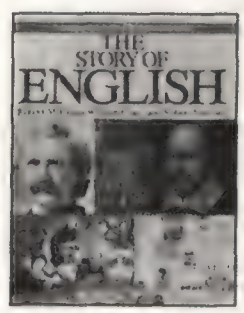

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Using 3-D slice-of-space map, CfA's John Huchra, Margaret Geller, developed bubble theory of galaxies.

According to bubble theory, galaxies are ranged as if glued to filmy walls of astronomically large bubbles.

is similar to what happens when a line of cars on a one-lane road catches up to a slow-moving truck; the clouds of gas and dust run into these waves of greater density from behind, pile up on themselves and become dense enough for hot stars to form. These stars are very bright in themselves, and energetic enough to make the remaining gas around them glow. When we look at a galaxy from afar, it is these regions of bright stars that stand out—even though they may not be all that different from the surrounding regions.

Although there may be less to spiral arms than meets the eye, the structure of our galaxy is complex—far more so, in fact, than anyone realized until very recently. As the imaginary Andromedan astronauts mentioned earlier approach the Milky Way, they will see scattered around its periphery a series of small irregular galaxies. I think of them as "suburbs." They serve notice that a major population center is coming up.

Moving inward, the next component of the Milky Way is one whose existence has only recently been discovered: a sphere of "dark matter" that encompasses and extends far beyond the familiar disk (p. 46). We do not know precisely where it begins, nor exactly what it is. We only know it is there, and it is now thought that at least 90 percent of the total mass of the Universe is composed of this mysterious dark matter, leaving 10 percent or less in the form of stars, planets, comets, asteroids and everything else we are accustomed to think of as the domain of astronomy. That we are ignorant of the nature of 90 percent of our own galaxy and probably of the Universe as a whole is a profoundly unsettling thought.

How we know of missing mass

Astronomers have known for a long time that they were missing a big part of the puzzle. The clusters of galaxies do not contain enough detectable matter—stars and so on—to produce a gravitational field strong enough to bind them together, yet we can tell by their appearance that they are in fact gravitationally bound. This discrepancy is one portion of what has been called the "missing mass" problem, described in a two-part SMITHSONIAN article (May, June 1983) on how we believe the Universe began and how it may end.

Because of the behavior of a halo of hydrogen atoms that surrounds spiral galaxies, we have even better evidence for unseen matter in our own galaxy. Hydrogen atoms emit radio waves that we can detect. Think of each atom as a satellite in orbit around the galaxy. If all of the mass of the galaxy were concentrated in the regions where the stars are, then the farther out any given hydrogen atom is, the more slowly it should move along its orbit. In point of fact, this is not what happens. In every galaxy we can see, the hydrogen

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European Southern Observatory

In this spiral galaxy, seen head on, the broad spiral arms appear to take on the shape of an S curve. Bright magenta regions pinpoint hydrogen "nurseries" where hot, bright stars are being formed. Red line is trail of satellite that passed by as the photograph was made.

"satellites" all move at the same velocity, regardless of how far away from the visible stars they are. The only way to explain this is to assume that some material, the "missing mass" that we cannot yet see (but which is capable of exerting gravitational force), extends far outside of what we would normally call the edge of a galaxy. It must have mass, because it is exerting gravitational force.

The realization that, for all intents and purposes, this unknown dark matter is *the* matter from which the Universe is made has made it a top-priority subject for study both by astronomers and by astrophysicists. Though theorists are busy conjuring up new forms of matter (one class is known as "weakly interacting massive particles," or "WIMPs"), so far the mystery remains just that.

As those Andromedan astronauts continue to move inward, into the visible fringes of our galaxy, they next encounter a spherical halo surrounding the main disk. The halo is dotted with clumps of stars, hundreds of thousands in each, held in "globular clusters" by mutual gravitational attraction. The stars in these clusters are among the oldest in the galaxy, perhaps as much as 14 billion years old, which means they formed at about the same time as the Milky Way itself.

As the Andromedans fly farther into the Milky Way they pass through the main disk of the visible galaxy, with its spiral arms and sedate stars like the Sun, and move right on down to the center, to the sphere a few light-years across that makes up the heart of our galaxy.

Here millions of stars elbow one another for room. They are only light-weeks apart, instead of the light-years that prevail in our neighborhood. Unaided, watchers from Earth can see about 6,000 stars in the course of a whole year. But if you were on a planet orbiting one of these core stars, you would see a million stars in the sky (p. 53), hundreds of thousands of them as bright as the brightest star visible from Earth. There would be enough light to read a newspaper easily, even in the dead of "night."

One of those studying this star-filled center is Charles Townes, professor emeritus at the University of California, Berkeley, and a Nobel Prize winner in 1964 for his work on lasers and on masers, the microwave precursors of lasers. He and his colleagues have been mapping the radio and infrared emissions of molecular clouds in our galactic core. They have located regions that are very disturbed, with hot, turbulent gases swirling around as they rotate about the center. At the very center they have found a kind of cavity with only a few scattered areas of interstellar gas. The currently favored explanation is that about 50,000 years ago an explosion in the core blew most of the gas outward, leaving the cavity behind. The movement of gas clouds around the central region indicates that the clouds are in orbit around something very massive other than the stars that are present. If true, calculations show that the "something" must have a mass

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about two million to three million times that of the Sun. The most obvious candidate for such an object would be a massive black hole.

"We will have to wait for better instrumentation to get further evidence that there is a black hole at the center of the galaxy," says Townes, "but it seems to be the best explanation for what we see." Such a black hole would at least explain the orbits of the gas clouds.

Are there black holes at the centers of other galaxies? Of this Townes is fairly certain. "In some cases, yes, in others we have no evidence." His reasoning is simple: as large as the black hole may seem to us, it really involves only a fraction of a percent of the mass of the galaxy. In many cases it does not control the evolution of the galaxy; it is simply an ingredient. It is possible that a black hole formed in the Milky Way as dust and gas fell into the center, but equally possible that in other galaxies that same gas and dust failed to collapse into a black hole but condensed into stars instead. Only time and further observations will resolve the question.

Astronomers have seen that there is a lot more to a galaxy than just a pretty spiral of unimaginable proportions. What I find most striking is that while we seem to be reasonably familiar with the things in our region of the Milky Way, the outer reaches and the inner core remain mysteries. When we fully understand the Milky Way—dark matter, black hole and all—we will know a great deal more than we do now about the entire Universe.

Meantime, the study of other galaxies has led recently to an extraordinary insight into the possible structure of the Universe. We know that galaxies are not scattered randomly across space, but are found in clusters. The Milky Way and the Andromeda galaxy, for example, form the gravitational anchor for a collection of smaller galaxies. All 20 or so dance around one another as the group moves as a unit through space. The entire galaxy ensemble is called the Local Group, and it appears that most galaxies are similarly clustered. The Local Group is not isolated in space, either, but is part of a still larger group called the Local Supercluster. The great majority of the galaxy clusters are arranged in such superclusters.

Only in the past couple of years have we discovered that this rather regular, hierarchical structure is just the beginning of the story, rather than the end. All these galaxies, clusters and superclusters, are distributed as if they outlined the surfaces of huge bubbles. The Universe does indeed really seem to be a sort of foam, a place of nearly spheroidal voids with matter confined to their curving surfaces. Part of the "big picture" that we are grasping for the first time is the concept of voids that can stretch a hundred million light-years across the cosmos. Where the edges of voids come together, the richest clusters of galaxies are found.

These new perceptions are being pieced together in surveys of galaxies conducted at the Harvard-Smithsonian Center for Astrophysics (CfA) in Cambridge, Massachusetts. As the surveyed sections, each shaped like a piece of pie (p. 48), are fitted together, the three-dimensional structure seems more and more apparent. Some astronomers are calling the discovery of the bubble structure the biggest leap in understanding the Universe since Hubble first demonstrated that the Milky Way is only one among billions of galaxies.

Nobody can yet say how the bubble structure came into being. It may be that the voids are not truly empty but rather are occupied almost entirely by dark matter. Infrared astronomers are now finding evidence that the bubbles of bright galaxies may surround regions in which galaxies are obscured by dust.

Will this structure be seen everywhere we look in the Universe? Nobody knows. What does the structure mean for the long-term future of the Universe? Nobody knows. These questions are at the very edge of research today.

We have come a long way since the 1920s, when the known Universe expanded from just one galaxy to the 100 billion or so we know today. As the title of science writer Timothy Ferris' latest book, *Coming of Age in the Milky Way*, suggests, these are exciting times in the education of the human race. We are finding out more about galaxies all the time, including the fact that there is still much more to learn. In the meantime each of us, like the ancients before us, can look up on a dark summer night and marvel at the Milky Way, our home.

Sky over planet near center of Milky Way would have so many stars they would easily outshine its moon.

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By Robert Wernick

Out of dark dreams and bright hopes, the blazing art of Goya

At a tormented time in Spain's history, when enlightenment fought against entrenched power, Francisco Goya helped lead the way

Metropolitan Museum of Art

Goya marked stages of his life with self-portraits; this deeply preoccupied study was done in his 50s.

Naked and obscurely menacing, the giant figure lurches above the clouds, raising his burly arms. The gesture is ambiguous: threatening, certainly, but who or what is being threatened? Everything in the painting is ambiguous, as it often is in the works of Francisco Goya. Who is this colossus, where does he come from and what is he up to? Why does he turn half away from the mass of tiny humans, beasts and wagons caught up in a frenzy of panic that is scattering them in all directions over the valley? Why does the little white donkey in the midst of the tumult alone stand still? Commentators and critics have argued endlessly about what was in Goya's mind when he painted this picture. His work often has specific historical references, but since the date of the painting is in dispute, no one knows what it may be here. Some say the giant is Napoleon preparing to conquer Spain, others that it is the Spanish people preparing to drive out Napoleon. Others propose a storm, or the Inquisition, or Manuel Godoy, Spain's miserable Prime Minister. Whatever the interpretation, everyone responds to the disquieting dreamlike intensity of the painting, with its broad, brooding figure of the giant above the kaleidoscope of bright brushstrokes that forms the fleeing mob.

Like a dream, it can be interpreted in different ways. The genius of Goya often found itself working on different levels at the same time and on one level, at least, the painting seems perfectly clear. The giant's eyes are closed, and in Goya closed eyes almost always represent ignorance, the mind closed to the purifying light of reason.

Many of Goya's works contain or suggest political statements, which of course were more obvious to his contemporaries than they are to viewers two centuries later. In his lifetime there was never any doubt as to where his political sympathies lay. Again and again he pledged allegiance to the intellectual movement that had swept Europe and America in the 18th century, and had changed the climate of thought and feeling. Friend and foe alike knew it as the Enlightenment.

Prado Museum, Madrid

Overwhelming in impact and superbly painted, *The Colossus*, done between 1808 and 1812, was kept by Goya in his home. Variously interpreted, figure is still ambiguous: Napoleon? the Inquisition? No one knows.

The dark and blazing art of Goya

Royal Academy of Fine Arts of San Fernando, Madrid

Panoramic sketch of Madrid for cartoon from which tapestry planned for Pardo Palace was to be woven.

Opponents regarded it as antireligious; followers believed that with the light of reason they could sweep out the accumulated errors and congealed superstitions of centuries, and establish liberty, religious tolerance, justice, equality, a steady advance of humanity toward perfection. In France devotees were called *les lumières,* in Spain *los ilustrados*—and Goya was one of these. The Enlightenment was the theme of a magnificent exhibition of some 130 Goya paintings, prints and drawings, held last year at the Prado in Madrid. The American show (with some deletions and additions) opens January 18 at the Museum of Fine Arts in Boston, where it will be on view through March 26. On May 9 it will open at the Metropolitan Museum of Art in New York, remaining through July 16. Major sponsors of the exhibition are Manufacturers Hanover Corporation and the New York Stock Exchange.

Goya as an *ilustrado* has not been the conventional view of the painter in the last century and a half. He has usually been admired not for his devotion to reason, but for his preoccupation with the irrational. His work has been praised as impulsive, subversive, obsessive—current terms of commendation he would probably not have appreciated at all. In many ways he can be seen as the precursor of all the passionate, anarchic outbursts that have traversed the world of art since his day. His quick, choppy brushstrokes give his canvases a look of spontaneity and improvisation that the modern taste finds more appealing than the carefully smooth finish of older masters. But especially he has been admired, worshiped and imitated because of his exploration of the world of dreams, the unconscious, the boiling id that is supposed to underlie the orderly ego of classical painting.

This assumes that there were actually two Goyas, one the court painter, the magician of color who could turn out acres of sparkling portraits and bright, buoyant scenes of everyday life, the other a deaf, embittered solitary who, in drawings and prints that were never published and in paintings never offered for sale, scrawled grotesque and evil visions of a world that had gone mad.

If there were two Goyas, it has puzzled his biographers that they sometimes seemed to coexist so cozily in a single skin. He could swing from mood to mood and from style to style, from the lovely portrait of the Countess of Chinchón in Madrid to the etched plates of his *Caprichos* with their snarling rage against the hypocrisies and follies in that same Madrid. In the years 1812-14, when he was painting dashing portraits of the Duke of Wellington and General Palafox, happy warriors both, he was etching the now-acknowledged masterpieces, the *Disasters of War,*

The ambitious work was never executed because of death of King Charles III. Titled *The Meadow of San Isidro*, the tapestry would have marked one of Madrid's prominent celebrations, the Festival of San Isidro.

those screams against the cruel barbarities of war.

Goya was never an outcast; he loved society. Though a terrible and mysterious illness in the winter of 1792-93 left him stone deaf for the rest of his life, he learned how to lip-read, and he never lost his taste for the traditional Spanish *tertulia*, the evening get-together where good friends drink and talk for hours on end. He was from Saragossa in Aragon, and the Aragonese have a reputation in Spain for being hardheaded, stubborn, down-to-earth—the kind of man who looks out of so many of Goya's self-portraits, with his bull neck, snub nose and keen, deep-set eyes that missed nothing.

Robert Wernick wrote about the life and art of Paul Gauguin in SMITHSONIAN, *May 1988. His article on the Escorial appeared December 1987.*

He was more Sancho Panza than Don Quixote: he knew how to keep on good terms with the world. He was always aware that he had a job and a family to protect in a land full of police spies and informers. The dungeons of the Inquisition were not part of the picturesque past, they were in downtown Madrid, and he was faced with the possibility of being thrown into one when an investigative commission uncovered his *Naked Maja* (pp. 64-65) among the effects of the disgraced Prime Minister Godoy—it was then a crime in Catholic Spain to paint a female nude. He was official painter to the royal family of Spain for almost 40 years and, like officials everywhere, in troubled times he had to be something of a weather vane, turning with the winds of war and governmental favor. Whoever was on top in Madrid—Bourbon or Bonaparte, Spanish grandee or

Lazaro Galdiano Foundation, Madrid

Etching, *Ridiculous Folly,* shows row of fashionably dressed, vapid people being lectured to on tree branch.

Metropolitan Museum of Art

Goya's *Caprichos* series could be mordant and even grotesque, as in this etching, *Little Hobgoblins.*

French general, the Duke of Alba or the Duke of Wellington—Goya was there to paint them in all the splendor of their pride and the glitter of their multi-colored uniforms.

In his famous etching *The Sleep of Reason Produces Monsters,* Goya shows himself with a lynx at his side, a wide-eyed lynx that can see in the dark. He brought the same clear vision to his dreams as he did to the spangles and ribbons on his duchesses' gowns. No artist before or since has looked so piercingly into the world of darkness that lies inside us. He worked out for himself a way of translating to paper or canvas the peculiar language of dreams, their mixture of sharpness and vagueness, their expressive distortions. He can be seen groping his way to a new language in his work of the later 1790s. He painted the *Flying Witches* to amuse the Duchess of Osuna; in it the witches are indistinguishable from real people. They might be a company of actors, except that they are up in the air with no visible support. In *Little Hobgoblins* of his *Caprichos* series (left), which he was doing about the same time, in the middle of the plate, the hand of the sharp-toothed figure wearing a priest's surplice was normal-sized in the preliminary drawing, but as he went over it he extended the fingers, extended them with such fury that his chalk dug into the paper. The

Lazaro Galdiano Foundation, Madrid

In *Animal Folly,* a group of longbeards attempts to attract elephant, an animal Goya clearly never saw.

hand became a fearful appendage, and the funny little figure became a monster.

When he looked into the darkness to find monsters like these, he did not like what he saw. His hawk-faced men and his women with the bodies of owls, all the toads and bats and witches, were genuine monsters whom he hated and feared. These figures are not, as in traditional Christian art, demons who have taken human form. They are human beings who have turned themselves into monsters by their irrational behavior, their contempt for or fear of the divine light of reason. For Goya they were the enemy, the forces of darkness engulfing Europe.

By the ideals of the Enlightenment Goya's Spain was an appalling place, and as he rendered it in his savage etchings, as well as in the private paintings, he kept himself remote within the walls of his house. When he looked around him he saw a rigid and reactionary social and political system, a mass of brutalized peasants supporting a legion of idle aristocrats, corrupt judges, thieving lawyers, quack doctors, lazy monks.

There was, however, an active minority of enlightened noblemen and enlightened churchmen who saw that Spain could not go on living forever on the dreams of its past glory, that there had to be radical reforms. Soon after he was proclaimed king in 1759, Charles III, an enlightened despot, took the revolutionary step of promoting successful merchants and businessmen into the ranks of the nobility. There were plans to reform the archaic tax system and the corrupt legal system. Later, under Charles IV, there was even a Secretary General who tried to reform the Inquisition.

In a tradition-bound society like Spain's, a man generally had little choice but to follow in his father's footsteps. By Charles III's reign, however, there was some chance for social mobility, and Francisco Goya's career shows how an enterprising man could work his way upward, fast and far. His father was an artisan in Saragossa, a gilder who never had the right to put a "Don" in front of his name, but he sent his son to a school run by progressive friars whose reputation was so great that aristocrats were not ashamed to enroll their sons there and have them sit beside commoners like young Francisco.

Early marked out for a career in the arts, Goya married the sister of a successful painter, Francisco Bayeu, and after a few formative years in Saragossa and Rome, he went to Madrid. Charles III was determined to beautify his capital city, and he and his noblemen were filling their palaces with tapestries and paintings in the bright, light, rococo style. Goya, with his deft, lively line and his brilliant color sense, was

soon one of the most popular painters in Madrid. It was a fairly small place for the capital of a great empire, barely 150,000 souls when Goya arrived in the 1770s, and an ambitious, hardworking young man had no trouble in getting to know everyone, from the gaily dressed *majos* and *majas*, the sporty common people of Madrid, to dukes and duchesses and the royal family itself. In the years between 1773 and 1792 he was intermittently busy painting the cartoons that the weavers copied in thread to make tapestries for the walls of the various royal palaces. He took to signing himself Don Francisco de Goya.

He chafed at the restraints of painting for tapestry, and the weavers resented him for his bravura color effects, which were almost impossible to reproduce on the loom, yet both the cartoons and the tapestries remain one of the delights of Madrid. Their dominant note is one of carefree elegance as they skip through the pleasures of life in the waning 18th century, all games and dances, sparkle and fun. In some, however, a more muted, somber tone shows itself. In one tapestry cartoon a wounded mason being carried off by his comrades after a fall from a scaffold is a reminder that people can get hurt building palaces of pleasure. In *Winter* (opposite) the little group of weary peasants fighting their way through snow against a howling wind to bring their slaughtered hog to market; the bare, bent branches of the solitary tree; the man at the left with his gun ready to ward off bandits; the blankets wrapped around the stooped bodies, bring an uncomfortable touch of cruel reality.

Such glimpses of the miseries of life in 18th-century Spain are perhaps a reflection of the concerns of the enlightened nobles whom Goya met at court, nobles who sat for their portraits and sometimes tried to advance his career by arranging important commissions for him. They mark his entry into the camp of what would be called *los liberales*, those who stood for a constitutional monarchy guaranteeing the rights of Man, believing in free thought and a free press, religious tolerance, impartial justice—the ideals and goals of the American and French revolutions that had set the Old World topsy-turvy. Opposed to them stood *los serviles*, who believed in precisely the opposite: autocracy by divine right, feudal privilege, censorship, the Inquisition, rigorous orthodoxy in religion.

For Goya the *serviles* were the forces of the night, ignorance and hypocrisy and greed and cruelty, the offspring of tyranny and superstition. Against them he deployed all the arms of his rage and his skill. His first collection of etchings, the *Caprichos*, begins as a more or less lighthearted satire on contemporary morals. Here is el Coco, the Bogeyman, popping up in a cloak before a mother and her frightened children, and he looks frightening enough till you look closely and observe that he is wearing shoes like an ordinary human. He is in fact the mother's lover, dressed up to give the kids a good scare so that they will run off somewhere and leave the adults alone. As the series progresses, the satire becomes more ferocious. Men and women half turn into animals and birds of prey, asses sit on the judge's bench or dispense medicine, witches fly off to unholy meetings.

In the later series of the *Disparates* (Follies), etched during 1816 and 1817 but never published in his lifetime for fear of the censors, Goya goes further in his rage against human folly—so far, in fact, that many have seen in them a revulsion against the whole Creation, a denial that there is any sense whatever in the Universe. His contemporaries, though, could have detected a political message lurking in almost all of them.

Faith, hope, but little charity

Goya never lost his faith in the divine light of reason or the hope that it would someday shine all over the land, scattering its enemies as daylight scatters the owls and the bats of uneasy dreams. It was a faith that would be cruelly challenged over the years.

Goya's life alternated between glorious hope and crushing disillusion. His early career, begun brilliantly, was almost blighted when his patron, the kindly Infante Don Luis, brother of the king, died unexpectedly. It was almost destroyed again by the terrible illness of 1793, which left him deaf. At the age of 50 he had a passionate love affair with the beautiful Duchess of Alba, 16 years his junior, and spent some glorious months at Sanlucar, her estate in the south, but at the end he made her the central figure in an etching entitled *Dream of Lies and Inconstancy.*

As court painter he acquired fame and became quite rich. His realistic, Aragonese eye could see his royal

Prado Museum, Madrid

Depictions of the seasons contained appropriately stark *Winter*; weather-beaten peasants fight a bitter wind on their way to market. Goya's ability to show realities of a situation is clear in details that evoke an entire time and feeling.

Prado Museum, Madrid

Goya was at odds with King Ferdinand VII when he painted this portrait; he made do with studies.

National Museum, Stockholm

Finished in 1814, *Allegory on the Adoption of the Constitution of 1812* showed Goya's approval of event.

patrons for what they were, and if they applauded him for the brilliant color in which he bathed their uniforms and gowns and jewels, they must have been half-blind not to notice that he portrayed Charles IV as an amiable simpleton (*"Que tonto eres, Carlos,"* his father, Charles III, had said to him one day—"What an idiot you are"). Charles' wife, Maria Luisa, he accurately presented as an arrogant shrew, and her lover Manuel Godoy (the 18-year-old guardsman whom she made a duke, prime minister and commander in chief of the army) as a self-satisfied boor. In 1798 there was a sudden ray of hope when Godoy fell out of favor and a government of *ilustrados* came into office, with Goya's longtime friend and patron, poet-statesman Gaspar Melchor de Jovellanos, as Minister of Religion and Justice (below).

The first Napoleonic blunder

It was a false dawn. The *ilustrados* lasted only a few months in office; Godoy came back, and he and the queen had ten years ahead of them in which to lead Spain to disaster while the king stood by. Then in 1808, Napoleon, in the first of the major blunders that were to destroy him, invited the Spanish royal family to Bayonne, France, and kidnapped them. He bullied them into giving up the throne (they did not need much bullying) to his brother Joseph who, as King José I, soon arrived to rule in Madrid. He was an inoffensive, ineffectual man, better suited to being a real estate developer in New Jersey, which is what he eventually became, than a king. But king he was for a while, and he came down to his new domain with a mighty army and an ambitious set of reforms—abolition of the Inquisition, abolition of feudal privileges, freedom of the press—just what the *ilustrados* had been calling for all their lives. Many of them, many of the painter's friends, were glad to sign on with the new regime, and Goya painted them in the regalia of their new positions of authority.

The Spanish people would have none of it. They derided the foreign king as a vulgar drunkard, Pepe Botella, "Joe the Jug." In what could have seemed to Goya the most tragic of all ironies, they rejected not only French rule but French ideas. Many wanted the old Spain, the old religion, the old monarchy. They rallied around their priests to pray for the return of *el deseado*, "the desired one," the noble prince of their dreams, who in real life was Ferdinand VII (p. 63), cowardly, meanspirited and dim-witted, and living in luxury in the gilded prison of Talleyrand's Château de Valençay (SMITHSONIAN, November 1981). He squealed to his jailers when he heard of an English plot to rescue him, and groveled before Napoleon, begging to be allowed to marry a Bonaparte.

Prado Museum, Madrid

Only *Clothed Maja* is more provocative than *Naked Maja*, which caused Goya's questioning by Inquisition.

Prado Museum, Madrid

They depict the same woman, once thought to be the scandalous Duchess of Alba. Experts now say no.

Museum of Fine Arts, Boston

Idyllic work of old age, *Milkmaid of Bordeaux* was completed the year before he died in exile in France.

In 1798 Goya painted Gaspar Melchor de Jovellanos, an enlightened Minister of Religion and Justice.

The people rose to fight with handmade weapons against armies that had conquered Europe. For six years Spain was prey to the most atrocious of all wars, the kind for which a new word, *guerrilla*, was coined, a war without front lines or rules or mercy. Atrocities without number, pestilence, famine—Goya saw it all and recorded it in the series *Disasters of War*, hallucinating images of savagery and despair.

In one of the etchings a corpse lifts itself half out of its grave to scrawl a message: *Nada*, "Nothing." But Goya would not abandon hope. At the end of the *Disasters* series two prints proclaim that liberty can rise from the dead. In 1811, with the war raging everywhere, a group of leading *liberales*, lay and clerical, headed by Goya's old friend Jovellanos, who had refused to collaborate with the French, gathered on an island off Cádiz and worked out a Constitution, Spain's first, which was proclaimed in March 1812. Ferdinand, in exile, promised to accept it, and Goya and his friends could look forward to a new age of freedom. To celebrate the occasion, he painted a huge allegory (p. 63) whose theme has only recently been elucidated by Eleanor Sayre of the Museum of Fine Arts in Boston. Gowned in translucent white, a confident but wary maiden who represents the new Spain is being led into the future by Father Time, while history records the event in her ever-living book. Father Time holds an hourglass that has been turned over to mark the beginning of a new year, and the maiden holds a little book that is a copy of the Constitution of 1812.

The Duke of Wellington, whose Anglo-Portuguese army was playing a major role in driving the French out of Spain at the time, had a keener and more cynical eye for political realities than Goya. He found the people parochial in their attitudes, nearsighted about the Constitution and generally uninterested in the idea of nationhood. His opinion was justified. The new era lasted two years and two months. In the spring of 1814, as Napoleon was toppling, Ferdinand the *deseado* came back to his people and repudiated the Constitution, revived the Inquisition, restored feudal privileges and launched a bloody purge of everyone suspected of collaboration with the demon Bonaparte.

On the verge of the purge

The king thought Goya deserved to be punished, but the artist was famous enough and clever enough to be cleared of having painted portraits of José I's French collaborationist ministers, even a head of José himself in a huge work called *The Allegory of the City of Madrid.* (José's head was prudently painted out, and an inscription put in its place.) Goya made several portraits of his sovereign during the years 1814-20, though the two men detested each other and

Ferdinand would not sit for him; the faces in all the portraits are based on sketches made during two 20-minute sittings back in 1808. His allegory of the Constitution was rolled up and hidden. In his private notebooks he drew a mob of hoggish, triumphant monks bearing the dead body of constitutional Spain to the grave. In the house he bought in 1819 on the Manzanares—the people of Madrid called it the Quinta del Sordo, the "deaf man's house"—he covered the walls with the dreadful visions of his "black paintings," which are in part a reflection of his hallucinations during the illness that almost killed him that year, in part a comment on the state of Spain under Ferdinand. Here he painted a mob of bestial witches worshiping a great black goat; two peasants stuck in mud to their knees, beating each other to death with cudgels; a pop-eyed imbecilic Saturn, king of heaven, munching on the bloody corpse of one of his sons.

There was a brief revival of hope in 1820 when a military rising under General Riego forced Ferdinand to swear allegiance once again to the Constitution and introduce a whole set of liberal reforms. The *liberales* triumphed; Goya's allegory was unrolled.

But this new era lasted little longer than the first one. There were continual conspiracies and tumults, the country drifted into civil war. In 1823 a French army restored Ferdinand to power, all the reforms were repealed, General Riego was hanged, many of Goya's friends were jailed or driven into exile. Goya had to hide out at the house of a friend for several months. He could no longer live in Spain, a country that once again was suffocating the liberties and the aspirations of the people.

He was now an old man, nearing 80. He remained a wily, resourceful Aragonese, and he did not want to give up the dignity of his position as court painter or the handsome salary that went with it. He managed to persuade the authorities that he needed to go to France to take the waters for his health. In 1824 he left Madrid. He was never to return to Spain.

Goya was in Paris briefly, where the young men who were launching the Romantic movement were beginning to discover him through pirated editions of the *Caprichos* series, and were hailing him as a prophet and precursor of modern art. There is no record, though, that he ever met Eugène Delacroix or Victor Hugo or any of the rest of them, and they probably would not have known what to make of him if he had. He shared few of their notions. They might idealize the noble savage, but when Goya painted savages he showed them eating French missionaries in Quebec.

He settled down for the last four years of his life in Bordeaux with his mistress Leocadia. Old age did not diminish his curiosity or his spirit of adventure. He learned the new technique of lithography, invented in 1798, and produced the first great lithographs ever made. Though his hand had begun to tremble and he had to use a magnifying glass to see what he was doing on the canvas, he produced paintings like *The Milk-*

Prado Museum. Madrid

This detail from *The Pilgrimage of San Isidro* shows the power of Goya's tempestuous black paintings.

maid of Bordeaux (p. 65) with a freshness and vigor that would equal anything Manet or Renoir would do half a century later.

He took advantage of what distractions Bordeaux had to offer—the fair, the bull ring, the guillotine. He took walks with Leocadia's (and no doubt his own) daughter, Rosario, and gave her drawing lessons, insisting with parental astigmatism that she was a genius. He would talk and lip-read through endless *tertulias* with the throng of Spanish exiles who had taken refuge in Bordeaux, grieving over the long night that had covered Spain and calculating the chance of a return of the light. It would take 150 years for their dreams to be fully realized, and for Spain to acquire a constitutional monarch like the current ruler Juan Carlos and a government of committed reformers who would be proud to send to the world an exhibition of Goya and the spirit of the Enlightenment.

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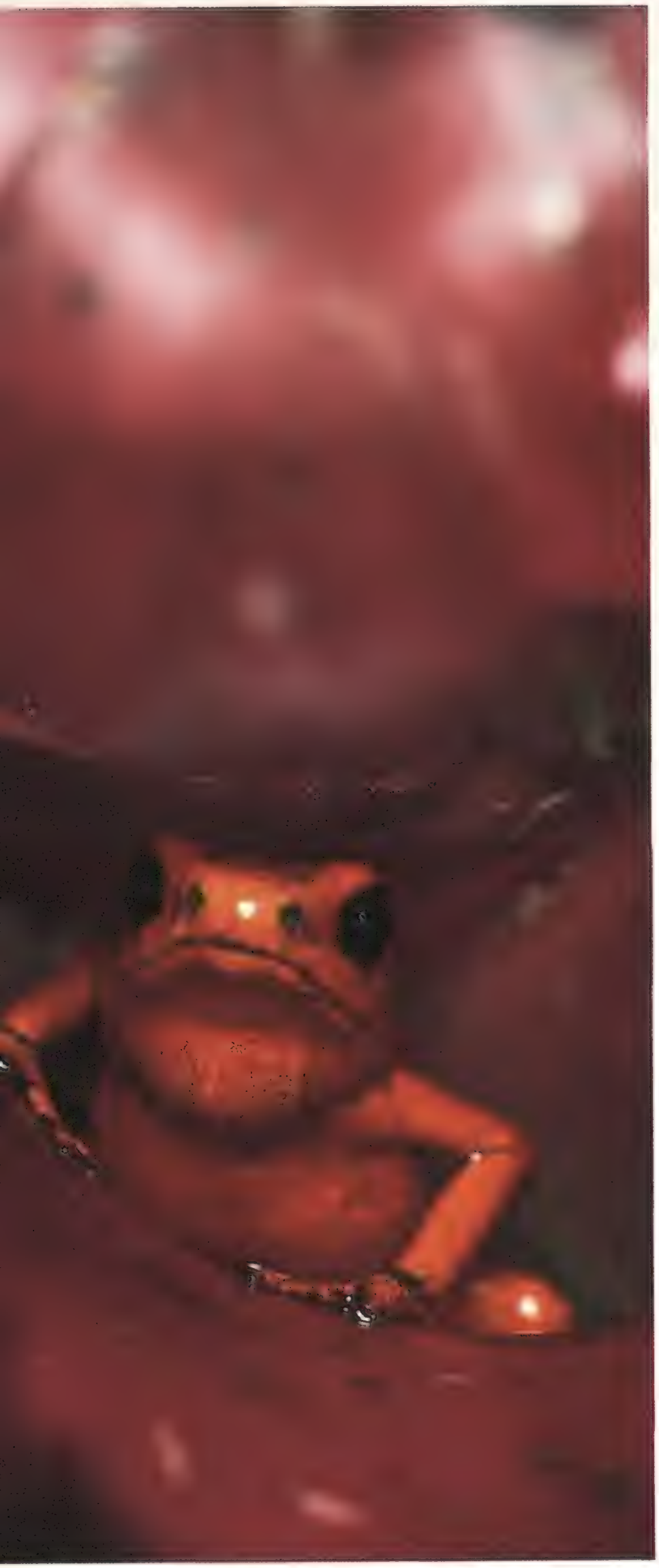


Perched on the lip of a bromeliad leaf, a tiny male dart-poison frog pauses between throaty chirps.

At National Aquarium in Baltimore, where these pictures were taken, Colombian frog peers from foliage.

By J. S. Bainbridge jr.

Frogs that sweat—not bullets, but a poison for darts

Tiny dart-poison frogs from Central and South America, most of them fairly harmless, are now attracting scientists and pet lovers alike

While they prefer tropical rain forests, frogs thrive in captivity, but have been reluctant to breed there.

In the South America of lore and legend, an Indian raises a long blowgun, takes aim at his quarry and lets fly. The prey drops, paralyzed almost instantly—not by the dart itself, but by the poison on its tip. Among the hunters of our sister continent, the knowledge and use of deadly natural compounds became a refined art.

Most of these poisonous compounds were extracted from plants and were often used on arrows as well as on darts. The compounds came to be known generally as curare, a substance administered in thrillers and murder mysteries. The word derives from three similar Indian words for poison and, technically, chemists now reserve it for a specific group of plant-derived alkaloids. On the Pacific slopes of Colombia, however, the Chocó Indians tipped their darts with a poison excreted from the skin of small, brilliantly colored frogs.

As long ago as 1820, Capt. Charles Stuart Cochrane, on leave from the British Navy, explored Colombia and described how Chocó hunters got poison for their darts by tormenting the unfortunate frogs until they "perspire very much." The frog sweat takes the form of white froth, in which "they dip or roll the points of their arrows, which will preserve their destructive power for a year. Afterwards, below this white substance, appears a yellow oil, which is carefully scraped off, and retains its deadly influence for four or six months, according to the goodness (as they say) of the frog. By this means, from one frog sufficient poison is obtained for about fifty arrows."

Today, most of the surviving Indians have turned to firearms. Only a few still use darts to hunt. But the knowledge and use of their dart-poison frogs has not been lost. What was once a hunter's art has been taken up by modern scientists, who study the toxins for possible application as anesthetics and cardiac stimulants.

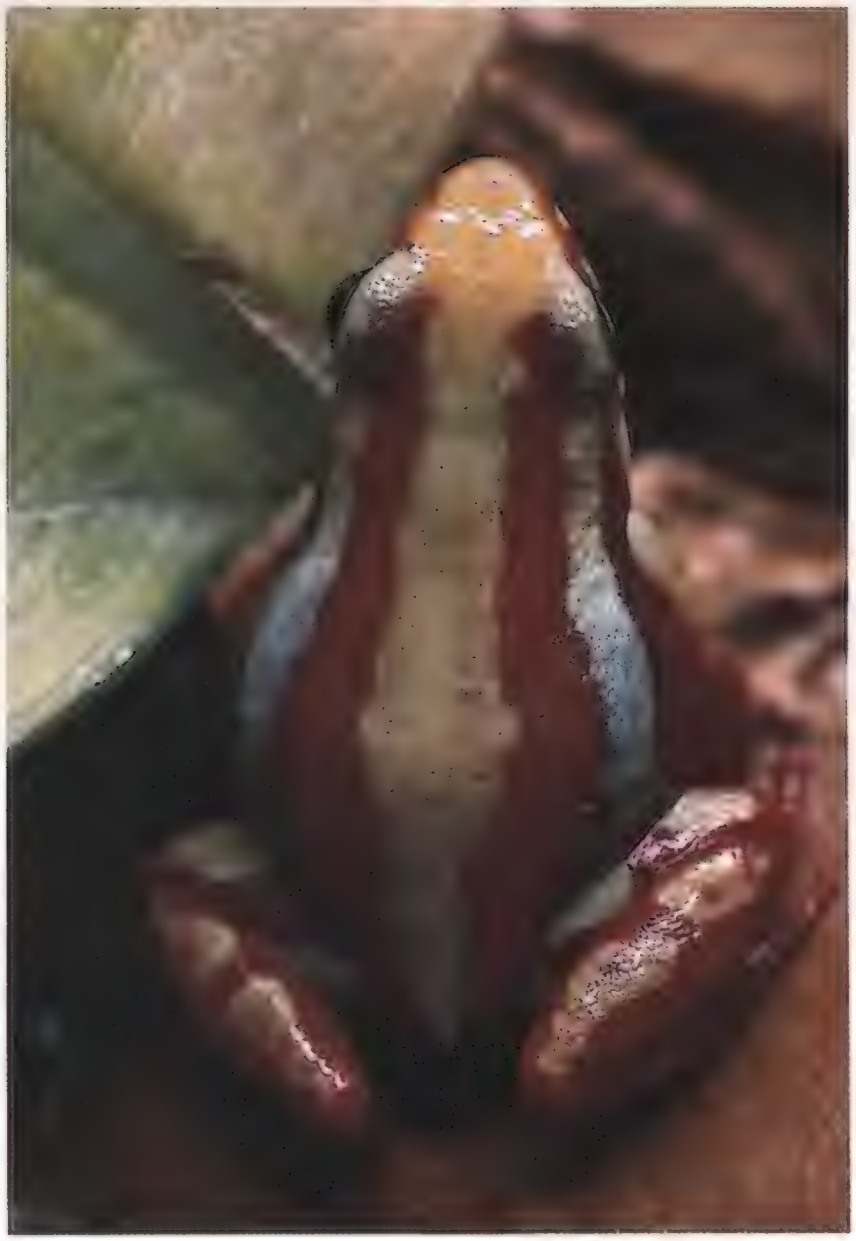
There are more than 100 species of dart-poison frogs that belong to the family Dendrobatidae. Only about half are toxic, however, and only three species are actually used for poisoning the darts. The poison secreted by *Phyllobates terribilis*, the most toxic species, is stunningly powerful.

John Daly, a chemist at the National Institutes of Health and an expert on dart-poison frog toxins, learned just how powerful while studying *P. terribilis*

Photographs by Robert Noonan

Mysterious, beautiful dart-poison frogs

Bright-yellow frog, here eating a cricket, is one of only three species from which Indians extract poison.

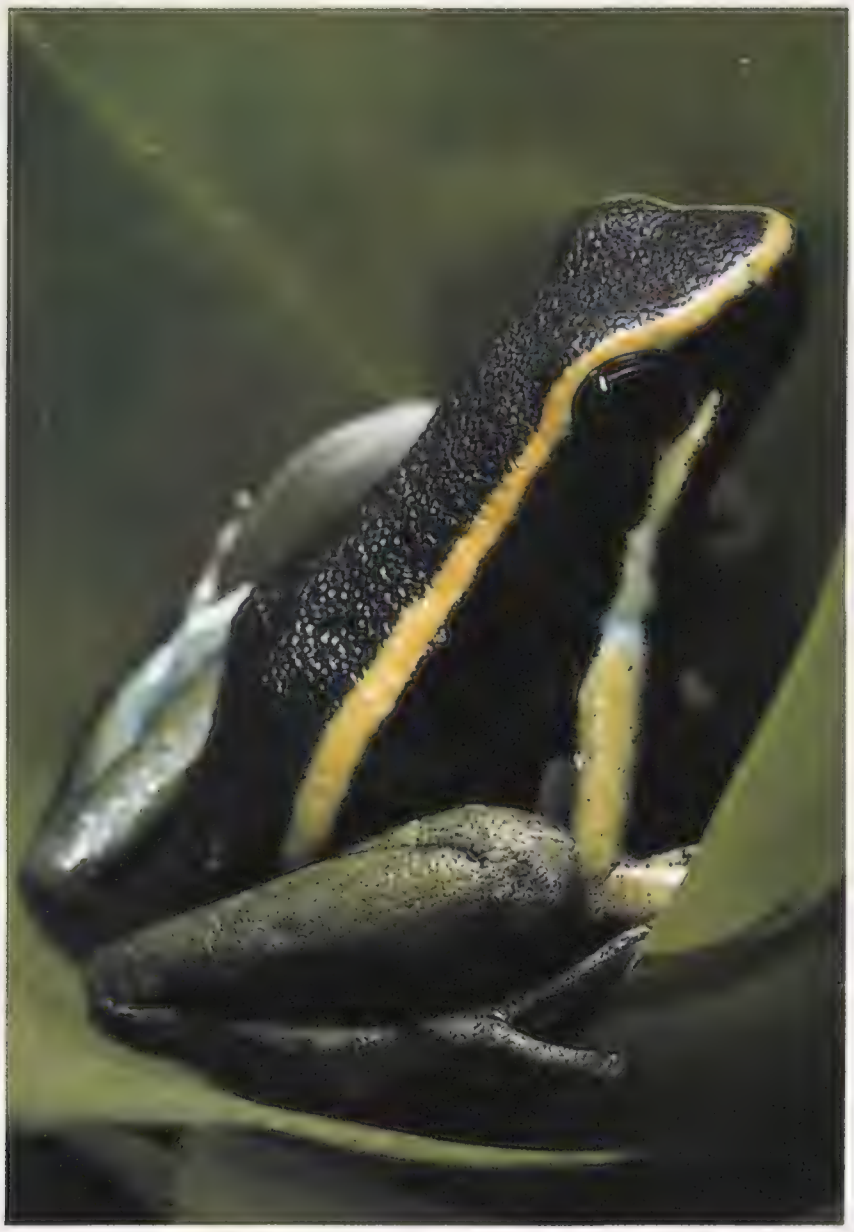


Candy-cane stripes decorate an Ecuadorian tricolor frog usually found along stream banks in the Andes.

on the Pacific coast of Colombia during the 1970s. Daly and his colleague Charles Myers, a curator at the American Museum of Natural History's Department of Herpetology, were staying with a family of Indians while collecting specimens. The scientists had carefully put on rubber gloves when handling the frogs and burned the gear afterward.

One morning, after rains had doused their trash fire, they awoke to find the bodies of a chicken and a dog near the contaminated garbage. The Indians concluded that the poisons from the frogs had killed their animals. Myers and Daly had to pay for the chicken but not the dog, which the family agreed was worthless. The secretions from the frogs "made strychnine look like table salt," Daly observes.

To determine toxicity of other frog species, researchers use an inelegant test—simply touching the tip of their tongue to the back of a frog under stress (usually pinching its leg creates stress enough). They have found that such a test on a *Phyllobates* species less toxic than *P. terribilis* produces a bitter taste and "a linger-



Some members of this species from Amazon River basin sport an extra stripe down middle of the back.

Seen close up, heavy granular skin of species at left oozes a milky, toxic secretion when the frog is stressed.

ing, almost numb sensation on the tongue, followed by a disagreeable tightening sensation in the throat." With *P. terribilis*, the taste test could be deadly. For this virulent, bright-yellow amphibian carries 20 times more poison under its skin than other species, enough to kill several people. The Indians always use leaves to protect their hands when touching them. There is no known antidote.

Even so, the deadliness of dart-poison frogs is not always as great as their reputation suggests. Four years ago, a Brazilian naturalist named Augusto Ruschi blamed his liver disease on a dart-poison frog he had handled more than a decade earlier. With much fanfare, the president of Brazil brought to Ruschi's rescue a chief and a shaman from the country's Txukahamãe and Kamayurá Indian tribes. Both agreed that the frog was the culprit. The cure: massages, herbal baths, and smoke puffed from hallucinogenic cigars and blown over Ruschi's body. Scientists familiar with the dart-poisons and their toxins, however, said that the cause of the disease had to be something else: frog poisons act quickly and primarily affect nerve and muscle, not the liver. In any case, Ruschi died despite the ministrations.

In nature, the frogs' known deadliness serves to protect not only *P. terribilis* but many of the less-toxic species as well. Most share a dazzling array of color schemes that stand out from the dark-green hues of the tropical rain forest. Some are bright red, others are blue with black spots, yellow with black bands, orange-swirled or three-toned. Their bold colors warn a legion of predators who normally eat frogs to stay away, and most species hop about safely during the day. The bright colors aren't so obvious at night, but these frogs for the most part lie low after dark.

Dart-poison frogs are found only in lower Central America and the northern half of South America. They are tiny, ranging from a half-inch to two inches in length. They can live along stream banks, in lowlands or high in the mountains. Some can survive dry, open

Author J. S. Bainbridge jr. last wrote for SMITHSONIAN *in August 1988 on the penal colony at Devil's Island.*

Mysterious, beautiful dart-poison frogs

Although it is only 1.5 inches long, this blue frog from Suriname is one of the largest of dart-poison family.

This frog's toxin is less poisonous than others, but its similar bright colors seem to warn off predators.

countryside, keeping moist in the shade. Many are territorial. Males (and even females of some species) stake out private turf, and warn off invaders and attract females with an assortment of chirps, peeps or trills. When the frogs clash, their battles can be fierce, but rarely life-threatening, for they are immune to their own toxins.

Unlike the familiar American pond frogs, many of these frogs breed away from water. And because the dart-poison frogs lay fairly few eggs—never more than 40 at a time, often far fewer—protecting them is critical. Dart-poison frogs tend to remain at the egg site, keeping the eggs moist until they hatch.

Once that happens, one of the parents will taxi the young to a watery site for the next stage of development. Such "nurse frogs" secrete mucus from their skin, and the tadpoles wriggle onto their backs, literally glued there for the duration of the journey. In some species, the tadpoles stay attached for more than a week until the nurse frog finds a proper pool, where the water loosens the mucous bond, setting the tadpoles free. Once loose, they begin to swim.

Sorting out the puzzling relationships among these frog species has been a longtime passion of taxonomist Charles Myers. Dozens of dots on a wall map of Central and South America in his New York office show where he has found specimens to help him analyze and classify dart-poison species. One of many mysteries he is exploring concerns dramatic changes in the color of one species. A *Dendrobates pumilio* with a red torso and black-and-blue limbs lives in an area that stretches roughly from Nicaragua down to Panama. But surprisingly, in the Panama area "an explosion of different colors" occurs in the *D. pumilio* populations (p. 77).

Their behavioral aspects suddenly vary too. Some frogs in Panama are easily caught; others are more elusive, swiftly disappearing into natural cover. These differences are so great that Myers wonders if what passes for *D. pumilio* is in fact several species.

Admiringly eyed by jewelry fanciers

With increasing knowledge of the dart-poison frogs has come greater interest in them, even, believe it or not, as pets. Because of their beauty and their ability to live in a tiny terrarium, they have been popular in public exhibits and even serve as models for jewelry. "Europeans like to keep frogs the way we keep tropical fish," says Myers. For the serious frog fancier there is even an international society for the study of dart-poison frogs, complete with its own newsletter. Though Myers' museum laboratory has been visited by the occasional jewelry designer looking for inspiration in his frogs' brilliant hues, he has yet to see any of them immortalized as a bauble.

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Dart-poison frogs are immune to one another's toxins; they frequently fight for mates and territories.

Opposite: Two *Dendrobates pumilio* show some of color variations that pose a mystery to classifiers.

Getting the tiny frogs to breed in captivity is a problem. At the National Aquarium in Baltimore, which houses one of the world's more extensive collections of dart-poison frogs, herpetologists Jack Cover and Anthony Wisnieski have been working with several species. A year ago, for the first time in the United States, they succeeded in breeding a blue dart-poison frog from Suriname, *Dendrobates azureus* (p. 74). In a small room near the aquarium's rooftop "tropical rain forest," dozens of frogs of several species can be heard chirping at one another from terrariums complete with special ground cover, mock tropical mist and nourishing bromeliads. After experimenting with various nature-like breeding containers, Cover and Wisnieski discovered that *D. azureus* preferred the overturned plastic casing that's fastened to the bottom of two-liter soda pop bottles. Its dimensions seem to provide just enough room for courtship, while being small enough to give the frogs a sense of security.

Meanwhile, NIH scientist John Daly and others are exploring the medical applications of frog toxins. Daly has isolated the alkaloids secreted by the three most virulent species and has labeled them batrachotoxins. Used in research as neuromuscular probes, batrachotoxins are enabling scientists to "find out basic things about how nerves and muscles work," says Daly. Another class of alkaloids acts as a heart stimulant and might aid cardiac patients by replacing more-dangerous drugs now used. A third class of frog alkaloids may prove clinically useful as muscle relaxants or anesthetics.

There is a major problem attached to studying the poisons of these frogs in laboratories. Frogs caught in the wild keep their dangerous qualities until they die, although toxicity levels do fall off. Unlike individuals born in the wild, those born in captivity do not secrete toxins, though they retain their genetic immunity to the poisons of other members of their species. Thus far no one knows why this is so.

Much remains to be discovered in the wild, too. About half the species known to us have been described since 1970. Is it likely that new types of dart-poison frogs are waiting to be discovered?

"Absolutely," says Myers. "New species are being found almost every year." Even now, on top of a remote South American mountain or in a dense, untrammeled rain forest, unique kinds of frogs, brilliant as enameled rainbows but perhaps capable of getting into a deadly sweat, are now calling to one another.

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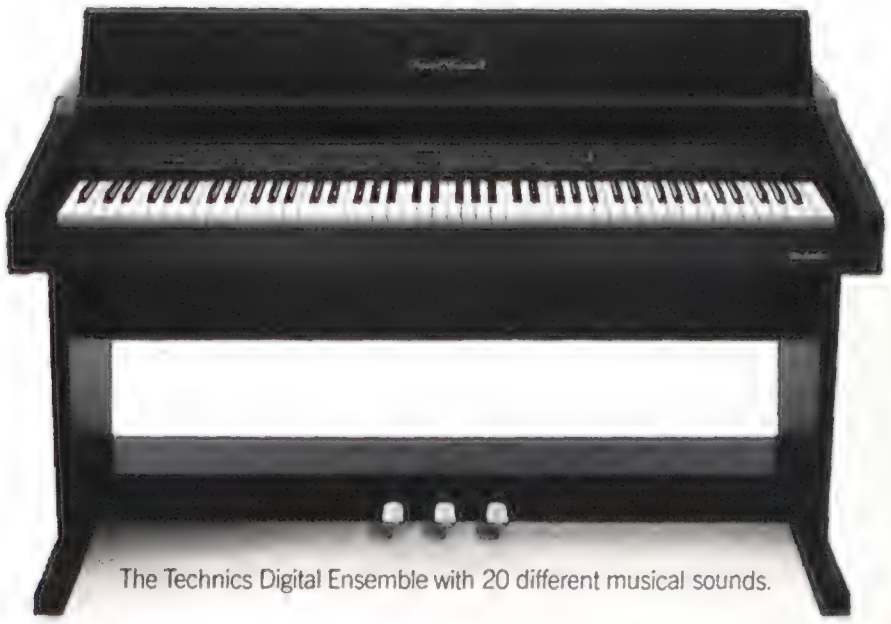

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By Timothy Foote

A tale of some tails, and the story of their shy creator

Adventures really begin when Peter squinches his way into Mr. McGregor's forbidden lettuce patch.

Peter Rabbit has been world famous for decades, but amazing Beatrix Potter is just beginning to become a celebrity too

"You don't suppose I shall be able to continue these d . . . d little books when I am dead and buried!!" The voice is that of a plump, weather-worn, middle-aged farmer writing to her publisher from Britain's Lake District in the year 1919. As usual the publisher is begging for another. As usual the author, now absorbed by really important things like rescuing lost lambs from the fells and seeing to her planting and poultry, is begging off. She had to confess that she'd never quite "understood the perennial charm" of that rabbit. She was "written out for story books," and her eyes were "tired for painting."

The publisher, Frederick Warne & Company, need not have worried. As things turned out, Helen Beatrix Potter's beautiful, quaint little volumes sold and sold, and went on selling. For in the decade from 1902 to 1913, Beatrix Potter's wry, spare prose and sunstruck watercolors had already created a countrified *comédie humaine* about more or less irresistible small animals. Among them: Peter Rabbit himself; Squirrel Nutkin, a saucy rodent with a death wish; Mr. Tod, the fox in the whipcord hunting jacket; resourceful Simpkin, a cat who imprisons mice under upside-down teacups; and, of course, Peter's brainier, braver cousin Benjamin Bunny.

Yet Potter's Peter, albeit a hare of very little brain, is still the most famous—and fastest selling—lagomorph in the world. The stories have been translated into 16 languages, including Greek, Welsh and Latin. Last year, led, as always, by *The Tale of Peter Rabbit* and now beautifully reprinted with a brand-new color process, her books sold some seven million copies in English alone.

In an age of "dumbing down" and kidvid violence, Beatrix Potter stories are indelibly, dinkily Victorian, marked by sly humor and shot through with references to things like camomile tea, patty-pans, muffetees and Rabbit-tobacco ("what *we* call lavender," Potter explains). The language is decorous, understated, subtle, occasionally studded with (good grief!) hard words. This, for example, is how *The Flopsy Bunnies* begins: "It is said that the effect of eating too much lettuce is 'soporific.' "

Potter, in fact, has a fine novelist's genius for first lines—and the use of memorably specific details. *The Tailor of Gloucester*, Potter's own favorite, begins: "In the time of swords and periwigs and full-skirted coats with flowered lappets—when gentlemen wore ruffles, and gold-laced waistcoats of paduasoy and taffeta—there lived a tailor in Gloucester." My favorite, her somber masterpiece *The Tale of Mr. Tod*, is more direct: "I have made many books about well-behaved people. Now, for a change, I am going to make a story about two disagreeable people." And *Squirrel Nutkin*, briefer still: "This is a Tale about a tail."

Sophisticated critics and creators from Graham Greene to Maurice Sendak have expressed affection for Beatrix Potter. Greene speaks of the prose, artfully simple, and those "brief pregnant sentences, which have slipped, like proverbs, into common speech." In a

Beatrix Potter at 39 in 1905. She is surrounded by a few of her creations, including Peter and (clockwise) Jemima Puddle-duck, Mrs. Tiggy-winkle, two bad mice, Jeremy Fisher, Peter's mom and boring siblings.

Dramatic Potter perspective presents the threatening visage of the cat Simpkin, glaring at busy mice.

celebrated essay written in the 1930s he noted an artistic evolution, from simpler to more complex stories, and suggested (with tongue barely in cheek) that at some time before writing *Mr. Tod* she had experienced a gloomy epiphany; thereafter some of the little books were marked by smiling villainy and a much darker view of human (or is it animal?) nature. The author was outraged. Nothing of the sort, she wrote Greene, adding that in any case she disliked "the Freudian School" of criticism.

Greene came closer to explaining one of Potter's page-turning charms with a phrase that both praises her and pokes a little fun at lit-crit jargon, describing her best books as the "great near-tragedies." And it is true, the perils of Pauline have nothing on Peter Rabbit & Company. Despite their mild manner and intense domesticity, her stories often put their furry protagonists in cliff-hanging jeopardy. *The Tale of Peter Rabbit* naturally *ends* with Peter home safe, being dosed with that camomile tea. Yet in the decades that have passed since this reader first heard the story and brooded over the pictures, he has not forgotten its heart-thumping suspense. Was Mr. McGregor going to stomp Peter with his huge boot? Would he be able to turn Peter into a rabbit pie? (A fate, Potter lets us know, that had already befallen Peter's father.)

The rabbit children in *Mr. Tod* are kidnapped and stuffed into a dark oven in a shadowy basement kitchen, waiting to be baked for badger Tommy Brock's breakfast. In *The Flopsy Bunnies*, after eating lettuce (which indeed proves soporific), more bunnies are caught napping by Mr. McGregor—whose role in Potter's cosmogony is roughly that of Professor Moriarty in the Sherlock Holmes stories. In yet another "dark" masterpiece, *The Roly-Poly Pudding*, Tom Kitten finds himself straitjacketed in a roll of dough, about to become a *nouvelle cuisine* protein delight for a sinister gourmet rat named Samuel Whiskers.

And then there is Squirrel Nutkin who, with a flotilla of fellow rodents, sets his fluffy tail as a sail (p. 84) and riding a twig raft lands on a nut-filled island presided over by a Tawny Owl named Old Brown.

Idiot Nutkin bedevils the long-suffering raptor with silly riddles, taunts and impertinences. Comes, finally, "a flutterment and scufflement and a loud 'squeak!' " But just as every right-thinking reader figures the little creep is about to get what's coming to him, the author makes a rare appearance in full regalia as Beatrix *ex machina*. "This looks like the end of the story," she writes, "but it isn't." And sure enough, on the very next page, Nutkin, no wiser but at least no longer able to use his tail for a sail—or for anything else, is let wriggle free.

In real life Miss Potter was totally unsqueamish, and rarely sentimental, about animals. A compulsive sketcher from the age of 8, she combined an artist's affection for creatures and countryside with a zoologist's exacting sense of detail. She had had an odd, lonely, extended childhood, living until she was nearly 40 in the nursery of her parents' house in London's fashionable Bolton Gardens. There she kept rabbits (whom she considered "volatile" and a bit "shallow"), a hedge-

Tied up and rolled in dough by two gourmet rats, Tom Kitten suffers in one of the scariest "near-tragedies."

In *The Tale of Mr. Tod*, a grubby and carnivorous badger, Tommy Brock, seems about to pay for his sins.

hog, snakes, bats, frogs, snails and salamanders. There *was* a Peter Rabbit, and before him Benjamin H. Bouncer ("Bounce" for short) whom she bought for four shillings and sixpence in the Uxbridge Road and brought home in a paper bag. The rabbits had leashes and traveled with the family on long summer holidays. Peter, unlike his eponymous literary counterpart, was clever; at least he learned to jump on command. Yet even as a child, when a pet died Beatrix Potter would boil it down to skull and bones in order to study the articulation of the skeleton.

Perhaps this bred-in-the-bone blend of knowledge and love explains the empathy Beatrix Potter's tiny pictures stir in the reader, and the often dramatic viewpoints (today they would be called camera angles) she paints them from. Potter's sketches and watercolors disarm even the kind of people who (despite Kenneth Grahame's water rat and E. B. White's Stuart Little) say they can't abide anthropomorphic stories about cunning animals in little knit suits.

Some of Potter's animal characters, of course, especially mice, squirrels, young rabbits, tend to go about unclad, or as unclad as anything with a fur coat can be. A few, like Tom Kitten and Peter himself, show a real genius for shucking what little raiment they start out in. Practically nobody wears trousers. Yet even standing erect, wearing jackets and (sometimes) shoes, Potter's animals *look* like animals, see the world (and are seen)

In harebreadth escape, Peter avoids McGregor's boot, knocking over geraniums as he leaps out a window.

from an animal's point of view. Describing what he called the "chameleon poet's" power to feel empathy with nature, John Keats noted: "If a sparrow come before my window I take part in its existence and pick about the gravel." Particularly in the close-ups, when Peter Rabbit is low-bridging it under the fence to get into Mr. McGregor's lettuce patch or when McGregor's great boot whizzes just behind him as he leaps out the tool shed window, knocking over the geranium pots, it takes a reader with a heart of stone not to *be* right there along with him. Probably the most brilliant camera angle in Potter's work occurs in *The Tailor of Gloucester.* From just behind three busily sewing mice we see beyond them (opposite) the threatening eyes and muzzle of the hungry cat Simpkin pressed angrily against a window.

After she had worked over a book (her method was to "cut, cut, cut," then "polish, polish, polish"), Beatrix Potter did not easily permit changes. For the third edition of *Peter Rabbit,* however, she let her editor at Warne & Company convince her to delete a picture of mean Mrs. McGregor offering the actual rabbit pie in which Peter's actual Papa serves as the main ingredient. The editor was Norman Warne. When the royalties from *Peter Rabbit* gave her enough confidence and income to buy a farm in the Lake District village of Sawrey, and at 39 to brave her parents' distaste for "trade," which included publishing, Beatrix became engaged to him.

Squirrel Nutkin and colleagues reach a nut-filled island by using twigs as rafts and tails as sails.

Norman Warne suddenly died of pernicious anemia a few weeks later. She was devastated. "I thought," she wrote in a poignant and uncharacteristically revealing letter to Warne's sister, "my story had come right, with patience and waiting." Despite grief and apparent unworldliness, right from the start she understood the "proper" merchandising of her books, boldly rejecting many commercial spin-offs, because, as she noted, "most toymakers have no taste or sense of style." But she herself designed and sewed the first Peter Rabbit doll, stuffing it with lead shot so it would stand up straight, and hoping, in a note to Warne, that its plush covering was tough enough so children wouldn't swallow the shot. Over Warne & Company's protests, she insisted the price of the little books be kept low (only a shilling in 1902) and the size small (the exact size most of them are today) so little hands could easily buy—and hold—them. But anything that would stay true to the original artwork—

Timothy Foote, a Board Editor, is the author of a book about Flemish painter Peter Bruegel. He is on the Executive Board of the National Book Critics' Circle.

chutes-and-ladders games, calendars, rompers sewed with Potter characters, Peter Rabbit mitts, slippers, tea towels and the ever popular cereal bowls—she was for.

The policy is still in effect at Frederick Warne today, despite the fact that in 1983 the company was bought up by Penguin Books. According to publisher Sally Floyer, a brisk Englishwoman who presides over the worldwide fortunes of Beatrix Potter books and products, the company continues to avoid "horrid" or "nasty" things. In practice this tends to mean anything made in shapes or out of materials upon which the Potter images cannot be decently reproduced. Floyer and Warne, however, have total confidence that the original books can go on attracting an audience broader than, say, the children of America's *Masterpiece Theatre* set, or any other precious few.

Nobody was talking Rabbits McMuffin

Early last year some Potter purists were jolted when the company agreed to a joint promotion with McDonald's. Nobody was talking Rabbits McMuffin, or even Eggs McGregor. But as one publishing executive told me, "You don't associate Beatrix Potter with McDonald's." One million Peter Rabbit "Happy Meal" boxes were sold, each decorated with Peter Rabbit games, each containing—along with the requisite McMeal—a paperback Potter book. When the one-month promotion was over, almost as many Potter titles had reached happy customers through McDonald's as are sold every year through U.S. bookstores. Floyer, who refuses to let her own four children have a TV set in the house, was delighted. "We have to face the fact that children live in a television age," she says, "and they want to collect things, decorate their rooms with favorite characters, and have them on their lunch boxes and T-shirts. Any publisher who just says 'We have this great line of books and you can go to the bookstore and buy them' will soon lose out."

Of late, quite apart from the English charm of Peter Rabbit et al., and the proliferation of merchandising spin-offs, which now net Warne & Company about $2 million a year, there are other reasons why Beatrix Potter, far from losing out, is practically coming in the windows. For one thing, the sales of children's books have more than doubled in the United States over the past five years, an upturn nobody can quite explain. For another, years after Beatrix Potter's death, the retiring author is at last becoming something of a celebrity, even on this side of the Atlantic. In America the process began with a splendid public television version of her life based on an equally splendid biography by English writer Margaret Lane. Last year Potterphilia was richly expanded by a huge exhibition, "Beatrix Potter: Artist and Storyteller," at the Morgan Library

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Practicing her watercolor techniques Beatrix Potter occasionally used museum models, like this ram.

As a child Beatrix sat for a number of portraits with her father, who taught her photography.

in New York (SMITHSONIAN, September 1979), which generated stacks of surprised and delighted media coverage and attracted 127,000 visitors. For three months streams of readers, two and three deep, most of them adults, made a slow progress from picture to picture, some making little pencil sketches of her pictures, some so excited that they chatted with perfect strangers. (One woman exclaimed: "All I can say is, she must have had a very patient rabbit!")

Gathered in from the Tate, and London's Victoria and Albert Museum, from the British National Trust and from private collectors, were all the papers and pictures that since World War II have kept turning up, often in the farmhouses that she owned around Sawrey and used as scenes and backdrops for the stories (p. 90). Photographs, cleverly illustrated personal letters, watercolors and drawings by the score of the cats, dogs, ducks, little pigs, foxes, hedgehogs, squirrels, mice and rabbits that would become her dramatis personae, as well as of weasels, bats, water beetles, damselflies, slop buckets, fossils, shrubs, flowers and country scenes from all over England. There were even microscopically detailed paintings of fungi from her early studies, which, in 1967, some 72 years after she did them, served as technical illustrations for a popular guide by W.P.K. Findlay, a former president of the British Mycological Society.

Here was the record of an extraordinary person, charged with talent and knowledge, who, from childhood, had been compulsively, compellingly, ceaselessly laying hands on the world. If the "d . . . d little books" did not exist, Beatrix Potter would be more than worth the attention that they eventually brought her.

She was born in 1866, a contemporary of Kipling (and of Freud). She was shy, immensely intelligent. Her life, at first afflicted by loneliness, sickness and depression, dramatically divides into two outwardly ill-

Detailed study of *Lepiota friesii*, done in 1895, was used 72 years later in a guidebook on fungi.

matched halves, one as youth and spinster in Bolton Gardens, the other as country wife in northern England. Tremendously busy, hating the pretentiousness of literary chatter about how she came to write her stories, she gruffly rejected most inquiries. As the books grew more and more renowned, their author all but vanished from the public's mind.

People, of course, had heard the story of how she wrote *Peter Rabbit*, nine years before it was published, as an illustrated letter to the 5-year-old son of her friend and former governess Annie Carter Moore. (The letter also has a famous first line: "My Dear Noël, I don't know what to write to you so I shall tell you a story about four little rabbits. . . .") But that was about it. So unknown was she, that in the 1920s a persistent rumor ascribed the authorship of the little books to Beatrice Potter Webb, the wife of Fabian Socialist Sidney Webb. By the 1930s many an affectionate reader simply imagined that the author of such old-fashioned stories must be dead.

What she had become, of course, and remained for 30 years, from her marriage in 1913 to country lawyer William Heelis, was a tough-minded, frugal, furiously energetic farmer. She threw herself into farming with passion and precise delight, gradually acquiring 4,000 acres in and around Sawrey, and five working farms, starting with Hill Top. She served as the first (and last) female president of the Herdwick Sheepbreeders' Association and as a judge of agriculture shows, where she was a familiar figure, by then a stoutish, red-faced party in tweeds thick enough to stop a bullet, woven from the wool of her own sheep.

Long before her death in 1943, with characteristic practicality—and help from the National Trust—she had pioneered sensible means of saving the land and traditional ways of the villages and farms in her region. She had also arranged for a local farmer to scatter her ashes over one of her favorite fields. Not even her husband, who died shortly after her, knew which field it was.

Nobody knows today, either. It was only after World War II that the first of what would eventually become a stream of Potterphiles began visiting Hill Top. They pieced together the details and episodes of her buried life, and paced the nearby villages which, they were astounded to find, were full of still-existing scenes and landmarks, houses and furniture, and even local inns, unchanged since they had been drawn or painted into the little books more than a half-century before. Today the farms and villages, with Hill Top as the focus, make a kind of museum area, which 80,000 Potter fans throng to each year. But for the first literary pilgrims, exploring the place must have been as exciting as discovering Faulkner's Yoknapatawpha County, without the Snopes family—unless you count the ill-smelling, carnivorous Tommy Brock.

One of the earliest and most graceful of these literary seekers was Margaret Lane, who swiftly wrote the first of her two charming and perceptive Potter biographies. The most faithful and tenacious was Leslie Linder. He is the one who, more than any other, laid the groundwork that eventually resulted in the Morgan Library show. Linder painstakingly assembled and edited more than 5,000 letters, paintings and memorabilia, producing *A History of the Writings of Beatrix Potter*. More important, in 1952 he got hold of something that may be Beatrix Potter's most remarkable creation, a manuscript she had never spoken

This watercolor, from *The Rabbits' Christmas Party*, was painted as part of a series for a favorite aunt.

After putting herself into a *Pigling Bland* sketch, author later cropped out everything but her hand.

of, whose existence no one suspected. It was not a children's story, but a 200,000-word "secret journal," kept from about age 14 to age 30 (roughly 1881 to 1897). To be sure it stayed secret, she inscribed much of it in a hand tiny enough to have been written by mice and in a secret code of her own devising.

The code seems deceptively simple. Its alphabet consists of a few letters that are themselves (*a* and *x*), a few that are merely transposed (*m* for *n* and vice versa), several wholly new symbols, and some Arabic numbers that, besides their direct numerical values, stand for words. The number *2*, for instance, also signifies "two," "too" and "to," while *3* is used for both "the" and "these." Even so, it took Linder and a part-time cryptographer six years to break the code, and another eight to translate the whole text and get *The Journal of Beatrix Potter* into print.

By the late 1960s, even in notably un-Jung and still-not-easily-Freudened Britain, psychologizing was in vogue. People who wrote about the journal tended to emphasize her young woman's bouts of gloom, her difficulties with her parents, the disadvantages and loneliness that had to have resulted from not going to school, as well as from living all those years in the nursery of 2 Bolton Gardens. Indeed, sparsely scattered through the journal is evidence that as a girl she was given to sick headaches, culminating in rheumatic fever which lasted throughout much of her 19th year, when (temporarily) her hair fell out and her bones were sometimes so painful that she screamed whenever she had to be turned in bed.

She was overly fond of childhood, which she associated with collecting and studying animals, especially during the long summer vacations. She had deep misgivings about growing up. Perhaps, though she never mentions it, this was because, being shy, brainy and having little money of her own, she faced the grim prospect of being an old maid in Victorian England. There was little hope, either, of a profession. "I am up one day and down another. Have been a long way down today," she writes at 16. "Will things never settle? Is this being grown-up?" And again, "How much I have to be thankful for, but these odious fits of low spirits would spoil my life." The memory of a spacious summer place they no longer rent, she says, "is the only bit of childhood I have left. It has been a terrible time since, and the future is dark and uncertain, let me keep the past." Nevertheless, she confided to the journal, "I *will* do something sooner or later."

Clearly she had bouts of deep depression. Clearly she suffered most of the standard difficulties of being the daughter of rich, conventional Victorian parents who, as Margaret Lane memorably puts it, "had fallen without knowing it under the most enervating and stultifying influence of their century—the sterile spell of moneyed and middle-class gentility." There were six servants. No one spoke at breakfast, and you had to be exactly on time for meals. In London, at least, she was not free to come and go much, and her mother

An imposing Lake District figure in tweeds and clogs, by 1931 Potter was renowned as breeder of sheep.

seems to have been a selfish pill. Above all, though her younger brother, Bertram, her partner in drawing and studying animals, went off to university, she only had tutors, followed by art lessons. Because of her parents' horror of "trade," even when her books began to sell it took her months of anguish and argument to defy them about Norman Warne. By 1913 she was 47, the author of 20 celebrated books, comfortably well-off and established in Sawrey. Yet she only got their permission to marry William Heelis because Bertram sided with her and shocked their parents by admitting that he had been "unsuitably" married for years without telling them.

Sometimes the fates seemed to be against her in special ways, too. Just before turning 30 she wrote a scientific paper on the germination of spores. The paper was accepted for delivery at the Linnean Society, but then it turned out the society did not permit women on the premises and it had to be read by a man. It was only then that she finally got up the courage to try publishing her stories.

But to emphasize Beatrix Potter's psychological woes is to miss the main point that her life and journal exemplify. For her triumph over gloom, self-pity and all setbacks of fortune came about precisely through the prime Victorian virtues of work and discipline. The nursery, though in some ways constraining, was the only practical place where she could go on studying lichens and mushrooms, watch her hedgehog go into hibernation, assimilate the zoological treasures hauled back after each vacation, read, draw and paint in a solitude that an early marriage or even a busy social life would have deprived her of forever. If life in the nursery prolonged childhood, it also prolonged scientific and artistic growth. Though she was shy, she knew her own powers. "If I had been caught young enough," she once wrote, "I could have become anything." But she also noted that her buried life had happily left her creative imagination untrammeled.

Millais kidded her about blushing

As the journal makes clear, she was far from locked away. Her parents were acquainted with everybody, from Edward VII's mistress Lillie Langtry, to politicians like John Bright (of the Anti-Corn Law League). Pre-Raphaelite painter John Everett Millais was a close friend. He kidded Beatrix about blushing, and once told her, "all sorts of people can draw, but you . . . have observation." If she couldn't go unaccompanied in London, her father took her about considerably, especially to the Royal Academy shows. The journal lists and describes dozens of paintings, often with her sharp, funny and irreverent comments. Trained as a lawyer, Rupert Potter nevertheless did not practice, but like so many Englishmen he painted watercolors and became a celebrated photography nut. He taught Beatrix to use a camera, too, while tirelessly turning out skillful portraits of the family and of famous contemporaries. His best was of Prime Minister William Ewart Gladstone, whom the young Beatrix did not like. When Tennyson died in 1892 she mourned him in the secret journal with the comment "What a pity it was not Mr. Gladstone."

A critical maverick in other ways, she took a dim view of the established creeds of her day ("prejudice and tradition count for three-quarters in matters of religion") but found solace in the language of the Psalms, as well as in the poems of Wordsworth and the letters of Matthew Arnold. She read the newspapers avidly, making comments on everything from the fall of Khartoum to the disorder sown in London by the Irish Home Rule bombings. "Really, we shall be as bad as France, soon," she sniffed.

She even read the financial pages and had a head for figures. One of the subthemes of *The Tale of Ginger and Pickles*, one of her funniest books, is what happens

The road where she and her husband used to walk became the background for the illustration opposite.

to storekeepers who extend too much credit. She also had a prodigious memory. At 28 she decided to learn six of Shakespeare's plays by heart. A year later she had them all letter-perfect (not counting "this" for "that" as a mistake), and *Henry VIII*, Act V, which she "never knew well."

Brief, highly specific portraits and descriptions leap from the pages of the *Journal*, as they do from the little books. She visits the dentist (for the first time) and reports that "his fingers tasted muchly of kid gloves." Her pages are full of grim Dickensian oddities garnered from all over. Because there used to be a bounty on rats, she notes, small boys fished for them "with hook and line" down the grids in the streets. Each year, it is said, "the streets and dustbins of Manchester produce 7 tons of dead dogs and 13 of cats." In 1882 she reports the death of an old woman who watched the beheading of Louis XVI in 1793. (It was this sentence with its Arabic and Roman numerals that first gave Linder a clue to cracking her code.)

But most important, the journal, like the sketches and the paintings, shows her extraordinary delight in the English countryside and its living creatures seen during vacations that her parents took the two children on every summer. At first their rentals were in Scotland, later in the Lake District where Beatrix found Sawrey. She and Bertram roamed the hills and fields, foraging for frogs or lichens, examining mushrooms and badger sets, sketching everything from scenery to salamanders. When one of their pet animals died, they often stuffed it or boiled it down to take to London. Near the end of her journal Beatrix describes a moment when she disturbed a shelf in the nursery and a rain of tiny glass eyes and mouse skeletons smashed to the floor. She picked them up and reassembled the skeletons, enjoying the "beautifully minute differences and fittings together of the bones."

In another age, she might have been an eminent scientist. Her methods were painstaking, her observations sharp, her thoughts original. But her grandparents had been sturdy folk from the north of England, and she was drawn back to the country. Art, not science, proved to be her escape vehicle to nature, which she once described as that "unchanging world of realism, which in our Northern clime is stiffened by hard weather . . . and the strength that comes from the hills." The marriage to Heelis merely confirmed that she had left the south and the heart-wearying roar of London behind for good.

Readers fond of literary symbolism may choose to see Beatrix Potter herself in *Pigling Bland*, the book she brought out the year she married: it includes a picture of two little pigs strolling together, and another of a boy and girl pig running away together to escape the market. But Mrs. William Heelis would have none of *that*. "The portrait of two pigs arm in arm," she wrote a friend, "is not a portrait of me and Mr. Heelis, though it is a view of where we used to walk on Sunday afternoons! When I want to put William in a book—it will have to be some very tall thin animal."

French novelist Albert Camus, no lover of nature, once observed that the life of a writer is often the return, through art, to those images upon which the heart first opened. Beatrix Potter was plainer spoken. "What heaven can be more real," she wrote in her journal a short time before she stopped keeping it, "than to retain the spirit-world of childhood, tempered and balanced by knowledge and common-sense, to fear no longer the terror that flieth by night, yet to feel truly and understand a little, a very little, the story of life." And that is precisely what her "d . . . d little books" would eventually convey.

Pigling Bland (left) and brother set out for market as joyfully as Beatrix Potter set out at last for Sawrey.

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Let's get it together... buckle up.

THE SEVEN MILESTONES OF WISDOM *Tips from a Shrewd Traveler*

Travelling and shopping have something in common: when you first start each of them on your own, there's a certain glamor to them. Freedom of choice, on your own at last: Chicago tonight and Tulsa tomorrow, Tucson the day after that; and then on to San Fran, and over the Pole to London: ah, the romance of it all.

One does wish to make a good impression; you're not flying all that distance to appear before a bunch of suavely-coiffed natives looking like you spent last night in a doorway on Skid Row. That's why the shopping's exciting. The very best is hardly good enough, and now you have an excuse for buying it: "After all, dear, I can't go in there dressed like a bum." And how to transport what Caesar called impedimenta and George Carlin calls your stuff? Why, in the most ornate of hide valises, of course, replete with straps and buckles.

Slowly, you begin to learn.

First that Caesar had porters, and we have hotels designed by architects laboring under the misapprehension that such servants still exist. This is why you leave the cab (into which you humped your baggage at the airport) on the street level, struggle to the check-in desk, plunk the baggage down, register, and get directions to the escalator leading to the mezzanine, where you will (perhaps) locate the bank of elevators serving the floor where your darkened room awaits your profane effort to secure entry with a coded card that does not work.

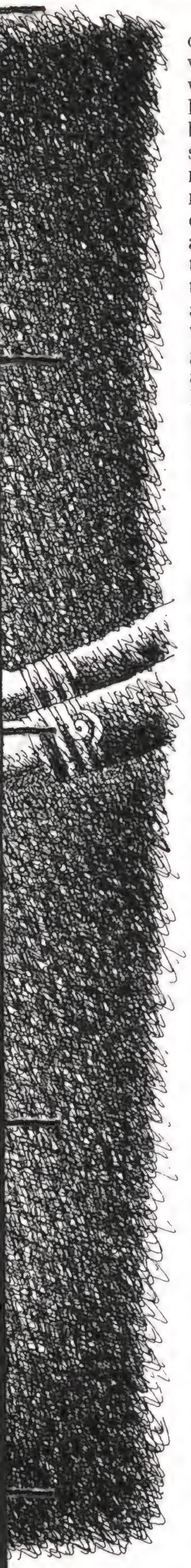
It's astonishing how much bad language one can address to an inanimate piece of luggage

that would delight a Russian czar (who had serfs) when one has to portage the wretched thing to the room one's self. After a few tantrums—and cautionary remarks from concerned hotel employees utterly oblivious to your struggles, but consternated by your choice of words—you achieve THE FIRST LEVEL OF WISDOM:

The bag when it is empty should not weigh half as much as the bag when it is full,

because you are going to have to carry the blasted thing and it will make your back hurt if it is too heavy.

BY GEORGE V. HIGGINS *(With apologies to T.H. Lawrence)*



You become shrewd. The hides of animals, when made into luggage with elegant fittings and straps, weigh more than the average French poodle (standard bred, before clipping). You replace your scarred valises and resort to man-made fabrics, such as parachute nylon that weighs less than a set of indecent lingerie, cram it full of all those nifty clothes you bought to impress the villagers, entrust it to the baggage-smashers at the airport, and arrive at your destination with tattered containers of grease-stained garments that not all the perfumes of Arabia (as Lady Macbeth lamented) could cleanse of travel soil. This is your introduction to THE SECOND LEVEL OF WISDOM:

The pilots and the flight attendants get on the plane with you, but the baggage handlers stay on the ground.

They do not care one way or the other whether you have clean underwear in the morning, access to your prescription medicine tonight, or "a very pleasant day." What they care about is having coffee. This means they wish to hammer your belongings cross-ways, sideways, upside-down or inside-out into the cargo hold, and return to the terminal—where it is (a) warm in the winter; (b) cool in the summer—as fast as possible. (Both answers are correct.)

YOU HAVE NOW REACHED THE THIRD LEVEL OF WISDOM:

Everything in life's a blasted trade-off.

Somewhere between the sturdy luggage you can't carry, and the plastic rubbish bags masquerading as the same, there must be a set of containers that a person fit enough to lift a sandwich in one hand and a beer in the other can portage from portal to portal without fear of a spinal episode, or that of destroying his clothes.

There is. Lands' End makes it. I have the Square Rigger® set. I have taken it literally around the world once, and the equivalent of another one and one-half voyages since—all of this in less than three years. I have seen it dropped on the tarmac in Athens, kicked onto the carousel in Hong Kong, treated with extreme disrespect in Sitka, mishandled in London, dropped in Paris, and assaulted and battered in Boston more times than I can count. It's really dirty now, and the ring on the zipper of the monogrammed right compartment of the two-suiter's busted (I clamped it together with pliers). The toilet kit is perfectly fine; when the lumpers dropkicked the overnight bag into the bay in New York, popping the top off the shampoo and leaving me in my room with a slippery parcel of suds, I dumped out the contents and washed out the kit, and by heaven, it's now good as new.

WHICH BRINGS US TO THE FOURTH LEVEL OF WISDOM:

What you put into the bags had better be as reliable as the bags.

For a long time I visited downtown stores and tried to get shirts built long enough to stay tucked into my pants. This should not have been a punishing chore; I am of average size (a little over 6'), reasonably slim, and do not do gymnastics. I do have religious principles forbidding me to spend sixty bucks on a damned Oxford cloth button-down shirt—blue, white, yellow, striped, doesn't matter—and I get really vexed when I pay a fair sum and the buttons come off. I also like polished cotton chinos, and repp stripe ties that are long enough to touch my belt buckle—is that asking too much? Yes, apparently. I resorted to the mall.

THE FIFTH LEVEL OF WISDOM:

Never go to a mall.

The first thing they tell you is that while they don't have it there, they have it in the downtown store. This is a lie, and one you will resent especially because you went to the mall because they didn't have it in the downtown store, and told you to go to the mall. Seething, you will return to your car in the parking lot, where you will discover either that the car is not there, because it has been stolen, or that it is there but a window has been broken and you, while being chilly, are not going to listen to any music going home, because the young gentleman who broke your window did it to steal your radio. It'll probably be raining, too. You can sit there in the traffic, getting wet and thinking about the clerks who don't understand what the word "shirt" means. That'll make your day. Tomorrow you can spend dickering with the insurance company.

THE SIXTH LEVEL OF WISDOM: Blaise Pascal was right.

Most of our troubles are attributable to our refusal to sit quietly in our rooms.

So long as we persist in that refusal, we need reliable means to minimize the troubles. When I need shirts, and ties, and pants that really look like the pants in the catalogue, and arrive in the ordered length in short order, with no hassle from the people I talk to, I call up Lands' End and order the stuff. They're cheery, and they get it right, and it comes to my house, and I put it in my Lands' End luggage and go out to do battle again. Because I cannot sit quietly in my room—not and make a living, at least.

THE SEVENTH LEVEL OF WISDOM:

There are some things that are reliable,

and those are exactly the things that you need on the road: the coffee at Dunkin' Donuts; a Zippo lighter (if you smoke); a trenchcoat that looks like it's spent much of its life wadded up in the trunk of a BMW (because it has); RayBan sunglasses; a $2.95 Parker Jotter (because you'll lose it, just like you did the vermeil jobbie, but it won't hurt so much), stuff from Lands' End, and the same elan that Scaramouche had: "He was born with the gift of laughter, and the sense that the world was mad." It helps if your luggage is tough.

Oh, and don't eat the food on the planes. ■

We asked our friend George V. Higgins to write this piece for us because we knew he's not only a gifted writer, but also a longtime Lands' End customer. His 18th book, WONDERFUL YEARS, WONDERFUL YEARS, is published by Henry Holt & Co. (And the Lands' End catalog is published 13 times a year—call ***1-800-356-4444*** *for your free copy.)*

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AVIATION

By Jon Krakauer

Daredevil pilots take glacier flying to new heights

Up in Alaska, fearless fliers land on mountain slopes to earn their livelihood. It's a risky business, but the office view is tough to beat

It's an ordinary June morning in downtown Talkeetna, cultural hub of Alaska's Susitna Valley, population maybe 250 on a good day. The dawn breeze carries the scent of spruce and wet earth; a moose wanders across the hamlet's deserted main drag and pauses to rub her head against the fence of the local ballpark. Abruptly, out at the airport on the edge of town, the peaceful mood is shattered as the engine of a small red airplane chugs two or three times and then catches with a roar.

The fellow in the pilot's seat is a big shaggy bear of a man named Doug Geeting. As he taxis his craft to the end of the runway, Geeting gets on the radio and files a flight plan in the terse, cryptic argot that's the lingua franca of aviators everywhere: "Talkeetna, four-seven-fox. We've got four souls going to the Southeast Fork of the Kahiltna. Three hours of fuel. Hour-and-thirty on the route."

"Four-seven-fox, roger," the flight-service station replies. "Wind three-five-zero at six, favoring three-six. Altimeter two-niner-eight-niner." Roughly translated, that means the wind is coming down runway 36 out of the north at six knots and Geeting's altimeter should be set at 29.89 to match the atmospheric pressure recorded at the station.

"Two-niner-eight-niner, roger," Geeting acknowl-

Airlifting climbers from Talkeetna to Mount McKinley, Doug Geeting's Cessna nears pass in Ruth Glacier.

Photographs by James Balog

edges. "Away we go." With that, the 35-year-old pilot pushes forward on the throttle, the din of the engine rises to an unholy wail and the little airplane leaps off runway 36 into the huge Alaska sky.

Beyond Talkeetna's one airstrip, one airport, half-dozen dirt streets, and ramshackle assemblage of log cabins, trailers, houses, Quonset huts and souvenir shops lies a vast plain of white birch, spruce, impenetrable alder and waterlogged muskeg—a mosquito's idea of paradise that's flat as a griddle and about 350 feet above sea level. Nearly 40 miles away, however, the immense ramparts of Mount McKinley—the highest point in North America—erupt out of these lowlands without preamble. No sooner is Geeting in the air than he banks sharply to his left, buzzes west over the broad, silty braids of the Susitna River, and points the plane squarely toward that hulking silhouette.

Geeting's craft is a Cessna 185, a six-seater with about as much room inside as a small Japanese station wagon. On this particular flight he is carrying three passengers, who are jammed into the cabin with a heap of backpacks, sleeping bags, skis and mountaineering paraphernalia. The men are climbers and they have each paid Geeting $200 to be flown to a glacier at the 7,200-foot elevation of Mount McKinley, which in Alaska is called Denali, an Indian word meaning the "High One." They will spend the better part of a month traveling to and from the 20,320-foot summit.

More than 900 climbers venture onto the slopes of McKinley each year, and landing them on the high glaciers of the Alaska Range is Doug Geeting's bread and butter. Glacier flying—as this demanding, dangerous, little-known facet of commercial aviation is generally termed—is practiced by pilots in only a couple of places in the world, with some half-dozen of those pilots based right here in Talkeetna. As jobs go, the pay isn't great and the hours are terrible, but the view from the office is tough to beat.

Twenty-five minutes out of Talkeetna, the first snaggletoothed ridges of the McKinley massif fill the windshield of Geeting's Cessna. Ever since takeoff, the airplane has been laboring steadily upward. It has now reached an altitude of 8,000 feet, but the pickets of snow-plastered rock looming dead ahead stand a good 1,500 feet higher still. Geeting, who has logged some 15,000 hours in lightplanes and has been flying this particular route for 14 years, appears supremely unconcerned as he bears down on the fast-approaching mountain wall. When collision seems imminent (by which time the climbers' mouths have gone dry and their knuckles turned white) Geeting dips a wing hard,

Jon Krakauer, who is based in Seattle, has written recently for SMITHSONIAN *about ice climbing, and the controversy over which is higher, Everest or K2.*

A plane heads west over jagged ridge toward misty peaks rising more than 12,500 feet into Alaska's skies.

Cessna 185 drones past an alpine snowfield. Bush pilots use this plane because it's reliable and powerful.

At that altitude, bush pilots are required to use oxygen. Without it, they may black out or get confused.

Hovering U.S. Army helicopter lifts injured climber from McKinley's south slope. Rescue took place in 1988.

throws the plane into a dizzying right turn and swoops through a gap that appears behind one of the loftier spires. The walls flash by at such close range that even individual snow crystals can be distinguished glinting in the sunlight. "Yeah," Geeting casually remarks on the other side, "that notch there was what we call One-Shot Pass."

"The first rule of mountain flying," Geeting explains in the laid-back tones of his native California, "is you never want to approach a pass straight on, because if you get into some unexpected downdraft and aren't able to clear the thing, you're going to find yourself buying the farm in a big hurry. I always attack a notch at a 45-degree angle. That way, I'm in position to turn away at the last instant and escape. If you want to stick around very long in this business, the idea is to leave your back door open and your stairway down and clear at all times."

A scene from the Pleistocene

On the far side of the pass is an alien world of black rock, blue ice and blinding-white snow stretching from horizon to horizon—a scene straight from the Pleistocene. Beneath the Cessna's wings lies the Kahiltna Glacier, a tongue of ice about 3 miles across and 47 miles long, corrugated by a nubbly rash of seracs and crevasses. The scale of the setting outside the plane's windows beggars the imagination: in a single sweep from glacier to summit, the peaks lining the Kahiltna rise a vertical mile and more. The avalanches that periodically rumble down these faces at 100-plus miles per hour have so far to travel that they appear to be falling in superslow-mo. Against this immense landscape, Geeting's airplane is but a red mote, an all-but-invisible mechanical gnat droning its solitary way through the firmament.

Ten minutes later, the gnat makes a 90-degree turn onto a tributary of the main Kahiltna called the Southeast Fork and settles into its descent. A crude snow-landing strip, outlined by a series of plastic garbage bags tied to bamboo tomato stakes, materializes amid a maze of huge crevasses. As the plane gets closer, it becomes apparent that the landing strip is not level; it lies on a gentle slope.

The thin air at this altitude has severely cut into the Cessna's power, and the plane will be landing uphill into a cul de sac of mile-high granite walls. Hence, Geeting cheerfully allows, "when you land here, you've got to nail your approach perfectly the first time. There's no such thing as a go-around." To avoid any unpleasant surprises, he scans the surrounding ridges for wisps of blowing snow that might be a tip-off to the existence of hazardous wind conditions.

As if on cue, the Cessna is buffeted by a blast of

Geeting, whose flying service is one of four operating out of Talkeetna, banks over glacier near McKinley.

Cliff Hudson (right) runs an air ferry with his son Jay. The elder Hudson is one of Alaska's pioneer pilots.

Former lieutenant governor Lowell Thomas jr., son of the famed broadcaster, owns Talkeetna Air Taxi.

severe turbulence, and the stall-warning horn shrieks as the airplane bucks wildly up, down and sideways. Geeting, however, has anticipated the buffeting and has already increased his airspeed to counter it. Serenely riding out the bumps, he guides the plane on down until the glacier rises to meet the craft's stubby aluminum skis with an easy kiss. Geeting taxis the Cessna to the uppermost end of the strip, spins the plane around with a burst of power so it will be pointed downhill for takeoff, then shuts off the engine. "Well, here we are," he offers facetiously, "Kahiltna International Airport."

Where flying is almost a way of life

Geeting's passengers crawl hastily out into the glacial chill, and three other alpinists, their faces purple and peeling, eagerly climb on board for a lift back. After five minutes at Kahiltna International, Geeting roars down the strip in a blizzard of prop-driven snow to pick up the next load of climbers back in Talkeetna.

From late May through mid-June, the busiest climbing season on McKinley, it is not unusual for the skies over Talkeetna to reverberate with the infernal whine of ski-equipped Cessnas, Helio Couriers and cloth-winged Super Cubs from 5 in the morning to well after midnight. If the racket ever cuts short anybody's beauty rest, however, no complaints are registered, for Alaska without airplanes would be as unthinkable as Iowa without corn. "Alaskans," writes Jean Potter in *The Flying North,* a history of bush pilots, "are the flyingest people under the American flag and probably . . . in the world. . . . By 1939 the small airlines of the Territory were hauling twenty-three times as many passengers and a thousand times as much freight, per capita, as the airlines of the United States."

The driving force behind this was a ragtag assortment of larger-than-life bush pilots like Carl Ben Eielson, Joe Crosson, Noel Wien and Bob Reeve, who cheated death on a daily basis to deliver groceries, medicine and mail. It was Crosson who pulled off the first glacier landing in April 1932, when he delivered a scientific expedition to measure cosmic rays 11,000 feet up McKinley's Muldrow Glacier. According to one of those scientists, the nonchalant pilot took the risky initial landing pretty much as a matter of course "and lit a cigar before leaving the plane."

It was left to Bob Reeve, a high-strung former barnstormer and bon vivant from Wisconsin, to perfect the art of glacier flying. Reeve was introduced to mountain aviation while pioneering long and extremely hazardous airmail routes along and over the Andes of South America between Lima, Santiago and Buenos Aires. One of his fellow fliers was a dapper, romantic French airman named Antoine de Saint-Exupéry, who would

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later write an intensely lyrical, hugely popular record of the early flying life, *Wind, Sand and Stars.* Reeve left South America in 1932 after incurring the wrath of his superior by smashing up an expensive Lockheed Vega. Finding himself broke and seriously ill back in the States, he stowed away on a freighter to Alaska seeking a change of luck, and wound up in the seedy port of Valdez (SMITHSONIAN, January 1988), now a major terminal for oil tankers.

Unfortunately, Alaska had already attracted plenty of hungry pilots in those Depression years and there weren't enough paying customers to go around. Desperate for work, Reeve decided to specialize in a corner of the aviation market that not even the Territory's boldest aviators had dared to pursue: landing gold miners and their heavy supplies on the glaciers that flowed down from the jumble of high peaks behind Valdez. He quickly developed a sense for steering clear of hidden crevasses, discovered that the incline of a glacier could be an aid to making short-field landings and takeoffs, and learned that by dropping gunnysacks onto the snow before setting down he could establish a horizon and judge the lay of a slope on cloudy days. In the spring and summer, when there was still enough snow to land high in the mountains but not enough to enable a ski-equipped plane to take off from the sea-level airfield in Valdez, he sheathed the bottoms of the plane's wooden skis with stainless steel scrounged from an abandoned cocktail bar and used the slippery mud flats of Valdez Bay for a runway.

When Bradford Washburn, a geographer and mountaineer who would later become director of Boston's Museum of Science, heard about those glacier landings, he wrote Reeve to inquire if he'd be willing to land an expedition on a remote glacier below 17,147-foot Mount Lucania. It was a dicey proposition, entailing 240 miles of flying over uncharted country and landing at an altitude of 8,500 feet—higher than had ever been accomplished in a heavily loaded ski plane. Washburn got back a telegram that said in its entirety, "Anywhere you'll ride, I'll fly. Bob Reeve."

The first flight to Lucania to cache supplies went off without a hitch in early May 1937. But when Reeve returned a month later to deliver Washburn and another climber, the Fairchild 51 sank to its belly in slush. Reeve was marooned at Lucania for four days and nights. On the fifth morning, slightly cooler temperatures formed a thin crust over the slush. Reeve tossed out his tools and emergency equipment to lighten the aircraft, adjusted the propeller with a wrench to squeeze every last ounce of horsepower out of the engine, and then committed the plane down the slope toward the lip of an ice cliff. "He dropped out of sight over the crest of the glacier," Washburn remembers, "and there was silence. Then suddenly we heard the roar of the engine and the plane climbed back into sight." By the time the Fairchild splashed down on the Valdez mud flats, it was sputtering along on the last vapors in the fuel tanks.

In 1955 Reeve was unavailable when Washburn needed a full-time pilot for a cartographic survey of Mount McKinley's south side, and a fearless young Talkeetna-based flyer named Don Sheldon was recommended. Washburn liked him, and another legend was launched. Taking advantage of the newly invented "wheel ski" landing gear—which permits a pilot to take off with wheels on a dry runway and then, while airborne, lower a set of skis into position for landing

Jim Okonek, a retired Air Force officer who flew helicopter missions in Vietnam, operates K2 Aviation.

Veteran Alaska pilot Kitty Banner owned K2 Aviation for three years. Okonek bought it from her in 1981.

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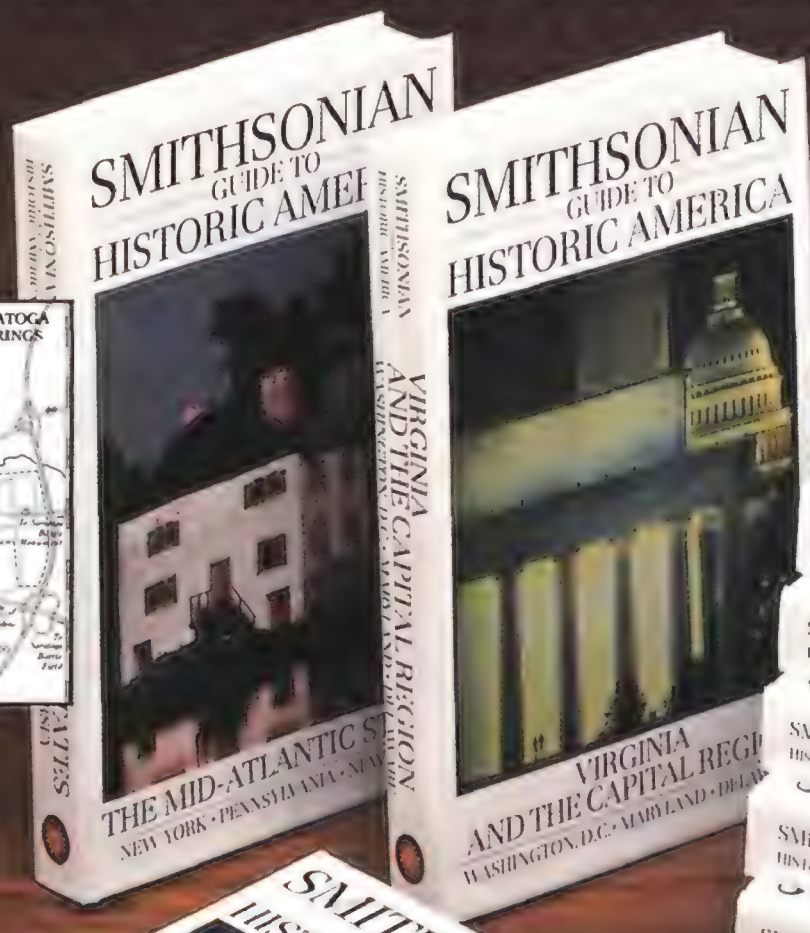
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G45/G46

On the Kahiltna Glacier, at an elevation of around 7,200 feet, passengers unload their skis, food supplies.

on snow—Sheldon flew commercially out of Talkeetna for 27 years, logging more than 800 hours each year. Along the way he went through 45 airplanes— four of them totaled in violent crashes—but he never injured himself or a single passenger. At the time of Sheldon's death from cancer in 1975, his name had become synonymous with heroic glacier flying.

Don Sheldon's career coincided with the mushrooming popularity of mountaineering on McKinley. Even so, most years he barely made enough money to pay the bills. "Nobody gets rich owning an air-taxi business," explains Roberta Reeve Sheldon, Don's widow and Bob Reeve's daughter. She still lives in Talkeetna, in a modest house at the end of the village airstrip. "I remember once we went to the bank and borrowed $40,000 to buy a new Cessna 180. Three months later Don totaled it. I'll tell you, it hurts to make payments on a plane you don't even have anymore." Insurance? It was so expensive in those days that the hard-pressed pilot had to fly without it.

Sheldon's financial woes were exacerbated by competition from a second, equally talented glacier pilot, Cliff Hudson. In appearance, they could hardly have been more different. The ruggedly handsome Sheldon was every inch the dashing bush pilot. Hudson, who is still flying, might easily be mistaken for a panhandler, thanks to the soiled shirt, shiny slacks and cheesy black loafers that make up his standard flight uniform. The two men were forever stealing each other's customers. Longtime Talkeetnans still vividly recall a fistfight that splintered the candy counter in the B&K Trading Post and left both combatants with black eyes and split lips. Things got so bad that Sheldon allegedly once buzzed Hudson at close range in midair, an incident that led to an investigation by the Federal Aviation Administration. Even today, it is not uncommon to hear barstool aviators at an infamous local watering hole called the Fairview Inn bickering over the relative abilities of Hudson and Sheldon in the manner of baseball fans comparing Maris and Ruth. There are denizens of the Fairview who argue that Hudson is at least as good a pilot as Sheldon was, pointing out that Hudson, incredibly, has yet to wreck a single airplane despite having logged more hours of glacier flying than any other man alive.

After Sheldon's death, Hudson enjoyed a few relatively flush years without serious competition. But by 1984 there were no fewer than four air-taxi companies operating full time out of Talkeetna—Hudson Air Service, Doug Geeting Aviation, K2 Aviation, and Talkeetna Air Taxi, headed by Lowell Thomas jr., a gentlemanly former lieutenant governor of Alaska and

The landing gear consists of a wheel-ski combination that's adjustable for use either on dry land or snow.

son of the famous broadcaster. All specialized in glacier flying and all were headed by daring, innovative pilots hell-bent on being top gun. Jim Okonek, the owner of K2 Aviation, candidly allows that "each of us considers himself the best pilot in town, and it's hard for us to imagine why a person would ever want to fly with anybody else."

Not surprisingly, the confluence of so many robust egos in such a small place throws off sparks from time to time. Insults are traded, clients are hustled. The pilots are constantly accusing one another of real or imagined breaches of regulations. The friction has escalated to the point where Geeting rarely speaks to Okonek or Lowell Thomas jr. and vice versa. The bad blood between Geeting and some of his competitors

On Kahiltna, surrounded by plastic sleds and other equipment, Jim Okonek enjoys a break between flights.

runs so thick that they can hardly bear to utter his name; when required to acknowledge the existence of his younger rival, Thomas reportedly refers to "that other fellow."

One of the few times the pilots put their differences aside is when they participate in an annual Memorial Day flyover, during which airplanes from each of the four companies fly in a tight V-formation over the local cemetery in a tribute to Talkeetna's war dead. It is a stirring sight. Not even for this momentous event, however, will Geeting and Okonek deign to speak to each other.

The competition in Talkeetna these days has motivated the pilots to seek out a clientele beyond the traditional fare of mountaineers, surveyors, hunters and miners. Geeting, for example, has contracted with the State Department of Fish and Game to fly misbehaving grizzly bears to distant corners of the Alaska Range. During one such flight, the unrestrained passenger partially awoke from a drugged stupor and expressed her still-groggy displeasure by shredding the plane's upholstery before Geeting managed to land and push her out the door.

Of the four air-taxi owners, Okonek has been the most enterprising at drumming up new business. Not long ago he flew a photographer and several young women to the Great Gorge of the Ruth Glacier, one of the most spectacular stretches of the McKinley massif, whereupon his female passengers immediately stripped to the buff and posed on the ice for what would become a memorable *Playboy* feature titled "Women of Alaska." "If you hope to make it in this business, you

have to be resourceful," Okonek says. "There just aren't enough climbers to go around."

In addition to bears and bunnies, all of the pilots now regularly take planeloads of tourists—ordinary vacationers from Philadelphia and Des Moines—on sightseeing flights to the glaciers. These trips have become so routine, in fact, that cynics suggest the risk and romance have all but disappeared from the job. Okonek, a retired Air Force lieutenant colonel who flew helicopters in Vietnam, disagrees, insisting that "this has got to be the best flying job anywhere. Jacques Cousteau's pilot once called me to ask for a job. Top commercial pilots from all over the world have expressed interest in working here."

Okonek takes quite a few airline pilots up to the glaciers on their layover days. "These are guys who fly 747s for Swissair and Qantas," he says, "and it bowls them over to see the places we land, the terrain we fly over. Glacier flying still holds plenty of challenge. Pilots lacking mountain experience will fly up the Kahiltna for a look around and get disoriented by the incredible scale of the peaks. All of a sudden their little airplane is out of breath, they're out of ideas about what to do and they crash onto the glacier. We see it year after year." Statewide, the number of fatalities resulting from mountain crashes is about a dozen a year.

Green flyers are not the only ones who smash into the Alaska Range. In 1981, an experienced Talkeetna pilot named Ed Homer took three friends on an afternoon joyride around McKinley, got caught in a downdraft while crossing Kahiltna Pass and slammed into the mountainside. By the time rescuers reached the wreckage four days later, two passengers were dead, the other had lost both hands to frostbite and Homer had lost both feet. "We're often up against a fine line in this business," Lowell Thomas emphasizes. "It's just a question of whether you can recognize when you're stepping too far over that line. And there are definitely times—usually when we're called upon to rescue climbers who've got themselves into trouble—when we step over the line quite a ways, and do things that are extremely marginal."

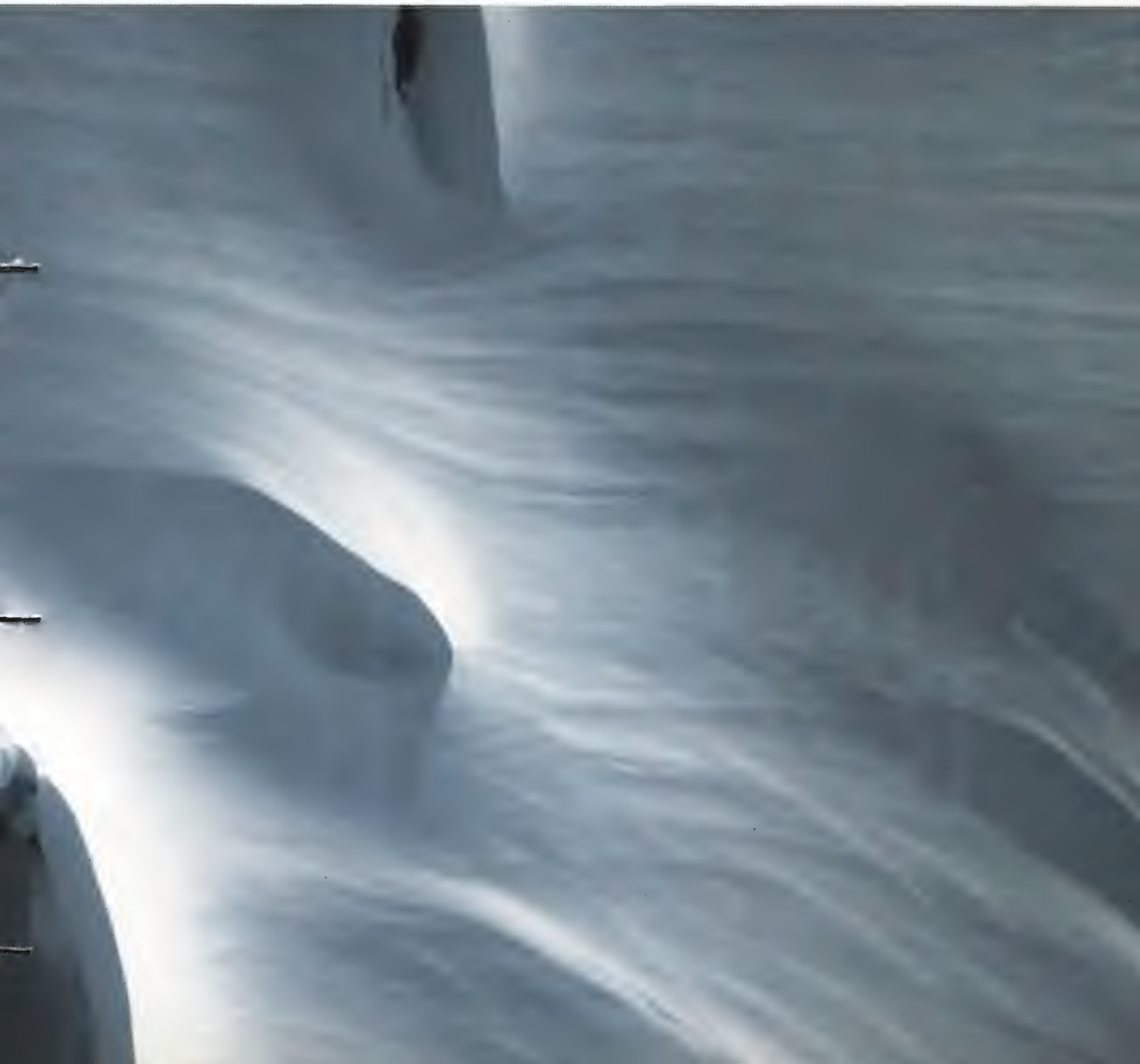
Geeting gets called out on a lot of marginal flights. Five years ago, a climber plunged 70 feet into a hidden crevasse near the base of Mount Foraker, a 17,400-foot peak southwest of McKinley, and suffered severe head injuries. After two days of stormy weather stymied several rescue attempts, a doctor on the scene radioed in desperation that the victim would die if he didn't get to a hospital soon. "It was completely socked in," Geeting remembers, "but I'd landed below Foraker before, and I'd memorized the layout of the surrounding peaks and ridges, so I decided to take a shot at evacuating the poor guy."

His plan was to approach Foraker above the clouds, get his bearings and then establish a precise descent pattern into the soup. "I'd fly straight for exactly one minute," he explains, "then turn for one minute, fly straight for another minute, turn again for a minute. It was a total whiteout—I couldn't see a freaking thing—but I trusted the course I'd worked out ahead of time and stuck to it. For a reference point, I asked the

Ferrying another load of climbers home, plane skims a creamy glacier seamed with treacherous crevasses.

people on the glacier to give me a shout on the radio every time they heard me pass."

From the time he dropped into the cloud bank, Geeting was irrevocably committed. The peaks looming unseen in the mists beyond his wingtips left absolutely no room for error. If he were to complete a turn a few seconds late, or steer a few degrees too far left or right, with each subsequent maneuver he would unwittingly compound the mistake, and eventually the plane would plow blindly into one of a dozen icy mountainsides at 110 mph. "I made my way down through the cloud between the mountain walls," Geeting says, "watching the compass, the clock and the altimeter real close, listening for the climbers to yell when I buzzed over them. I figured touchdown would be right at 7,000 feet, so when the altimeter showed 7,500 I lined up for the final approach, slowed to landing speed and went on in. It was a real odd feeling, because in a whiteout like that you can't tell where the sky stops and the glacier begins. All of a sudden my airspeed went down to nothing, and I thought, 'Sonofabitch!' Then I looked out the window and saw these climbers running out of the cloud toward the airplane. Damned if I wasn't on the ground."



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By Randall Peffer

On Malay Peninsula picking coconuts is monkey business

Bond between human trainers and their wily pig-tailed macaques, known as beroks, brings a rich harvest to local villagers

A full-grown berok, responding to master's commands from below, can toss down 500 coconuts in a day.

In the small village of Beladau on the Malay Peninsula of Southeast Asia, a number of grown men are shouting up into coconut trees. Atop each tree sits a monkey looking down at them.

"What good are those hands of yours?" one man shouts angrily; then he pleads, "Be a good monkey, pick the coconut."

A second man calls to another monkey, "Watch me, watch me."

He demonstrates what he wants by seizing his own head and slowly twisting it around. As his ears begin to turn blue, the monkey peers down at him and claps excitedly. Then, deciding to cooperate, the monkey twists off a coconut and drops it to his master below.

Malaysia harvests approximately 125 million coconuts a year. For centuries, Malays did all the picking themselves—laboriously hacking small steps in the tall, swaying trunks of coconut palms and climbing up to reach the fruit. But the work was dangerous and tedious. Now many have been replaced by a more efficient labor force of pig-tailed macaques. Connected by long thin ropes to their human partners on the ground, each monkey can pick 300 to 400 coconuts before the noonday sun gets too hot. The successful harvesting of coconuts is vital to the rural economy of the country, so the symbiotic relationship between man and these particularly intelligent and deft small primates is nurtured and supported by the government.

Pak Long Pin and his 6-month-old berok rest during a training session that helps build skill—and trust.

According to Malay tradition, Man did not inherit Mother Earth, he fought for her. Victory depended on establishing an uneasy alliance with the Monkey General, Hanuman, the immortal son of the winds, whose attributes made him a kind of simian James Bond. Malays, who make up more than half the population of the country, are almost unanimously Muslim, but there has also been a long history of Hindu influence in Malaysia. Thus Hanuman (a hero of the Hindu epic the *Ramayana*) plays a significant role in Malay folklore. The struggle to harness the energies of this wily monkey continues to be played out today in villages, kampongs, like Beladau.

There, as in hundreds of other villages in the coconut region along the east coast, the morning begins with the sound of caged *merbok* birds singing their fluty songs. Outside Tahar bin Embong's stilt house, goats, chickens and children run through the warren of underbrush and shacks. Women rewrap their sarongs as they finish their outdoor baths. Tahar is 52. He has spent the past 34 years of his life in successful partnership with monkeys. At 6:30, after his morning prayer, it is time for him to begin.

"Tahar Berok, Tahar Berok," villagers whisper as he stands for a moment on his porch adjusting the sarong knot at his waist; a coiled leash hangs over his shoulder.

"Berok" is the Malay word for the pig-tailed ma-

Photographs by Michael Freeman

Biking off to day's work, trainer Tahar bin Embong gives Cheh, his new berok, a lift to the picking groves.

caque (*Macaca nemestrina* to zoologists), Tahar's partner in the serious business of picking coconuts. The pig-tailed macaque is a large, russet monkey that is native to the rain forests of Southeast Asia. Males can measure two feet in length from head to buttocks and weigh as much as 40 pounds.

To call Tahar bin Embong "Tahar Berok" is to give him a title worthy of respect. He is a master trainer and owner of Betok, one of the fiercest and most-productive coconut-harvesting monkeys in the area.

Betok is a particularly large male who lives tethered to a 15-foot pole that stretches from the ground to a fork in a tree near Tahar's house. This morning Betok is in a fractious mood. When his master offers him a bowl of breakfast rice, the monkey grabs it and backs into the brush to feed. If anyone comes within ten feet of him, he bulls out his chest, bares his canines and lets go a screech. When Tahar steps closer, Betok flies at his face, making a grab for the Malay's handlebar mustache. At the last second the length of chain runs out and jerks the monkey off balance.

The animal glares at the man, and the man returns the stare until Betok, suddenly submissive, begins to cast anxious glances to his left. He clutches his knees and rocks his body back and forth. Tahar follows Betok's gaze to a monkey pole 30 yards away, where a female berok coming into mating season, paces, her buttocks swollen and red. Tahar shakes his head.

"No," he says to me. "Betok won't work today; he is more interested in this female."

Tahar walks to another pole and selects a monkey named Hitam, who waits quietly as Tahar clips him to the working leash. They climb on Tahar's bicycle—Hitam sitting on the handlebars—and ride off to a coconut grove several miles away.

A slow harvest by the sea

Tahar has contracted with a small kampong to harvest about 30 trees that belong to a group of fishermen. When Tahar and Hitam arrive everything is quiet except for bird sounds and a quartet of cats fussing over a shark carcass on the beach. The sea has eroded the land here and now the kampong edges a steep, ten-foot drop-off. Coconut palms are scattered among the stilt houses and Tahar sees a long morning ahead as he eyes the clusters of fruit hanging 80 feet overhead. Led to the first tree, the berok rapidly shins up. Tahar lets out coils of leash until the monkey is swaying among the fronds. Almost immediately the tree begins to shake as Hitam struggles to break a coconut from its tough stem. Rustling noises disturb the silence and Tahar moves quickly to dodge the coconuts that suddenly begin to thump on the soft ground around him.

After five or six coconuts are plucked, Tahar tugs on

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Tahar tenderly bathes partner who broke his leg while gamely trying to leap too far to next coconut tree.

Trainer changes leg bindings on the injured berok, who was hand-fed for several weeks while he recovered.

the leash, a signal for Hitam to climb down and try the next tree some 25 to 30 feet away. The work is slow; Hitam lacks the speed and strength of the larger, more-experienced Betok. But Tahar gives thanks to Allah because the young monkey is at least willing to work. After harvesting ten trees they take a break and share a coconut in the shade.

"Beroks are so like us," explains Fatima Busu, a Malay writer who frequently uses them as characters in her books. "They can be loving and cooperative, but also meanspirited, selfish and lustful. Also very independent. We can love this animal and hate it, all at the same time." Busu finds parallels between Hanuman and the "coconut beroks." In the *Ramayana,* Hanuman is an ally whom Rama needs to free his beloved wife, Sita, from the clutches of the demon giant Ravana. Hanuman possesses the stealth and cunning Rama needs to defeat the giant. But unlike Rama, the mischievous Hanuman does not hesitate to lie, seduce or change his appearance to gain an advantage. More than anything, Hanuman wants to assuage his insatiable hungers and win his share of approval from mankind.

So it is with the simian coconut gatherers. The monkey can be a staunch helper but also a tricky one. Betok's contrary little performance is typical, and Malay lore has many stories about monkey mischief. Obstreperous children are sometimes said to be possessed by a berok demon. Men are cautioned to adhere to their Muslim cycle of prayer or risk turning into a monkey.

"Pig-tailed macaques are clever, political animals," says primatologist Mikaail Kavanagh of the World Wildlife Fund—Malaysia. "In the wild, like most primates, beroks have good mother-infant bonding and particularly strong peer interaction and play." It follows, Kavanagh points out, that the people who train macaques to pick coconuts need a good understanding of monkey politics and body language. It is not just a matter of a monkey mimicking its master. Obviously a good trainer must be able to convince his berok that plucking coconuts for his owner works to the animal's advantage. But most trainers don't think their beroks work for food rewards alone; they believe there has to be something more.

A partnership built on affection

Tahar bin Embong thinks that the "something more" is a strong bond of friendship that anyone who has trained and loved a working animal will understand. "I give my monkeys affection every day," Tahar says. "I sit with them, and we groom one another. We share fruit or walk to the river together to bathe."

On the monkey's side, strength and intelligence are clearly essential. And nearly everyone agrees that at their best, these macaques are better at coconut picking

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Agile pig-tailed macaque moves deftly among fronds; some can jump easily from one tree to another.

than men. One who disagreed during my visit to the state of Trengganu was a Malay named Daud. Claiming to be "faster than any monkey," he challenged a coconut berok to a picking contest. As the villagers and I watched, they raced up two separate palms. Daud had three coconuts plucked before the monkey had dropped one. Daud returned to the ground, gulped down a pitcher of water and gloated over his competition's slower pace. But then he retreated in torment to the shade of a kampong hut to pick stinging red ants from his flesh. As the monkey started to climb a second tree, Daud was still sitting there nursing his wounds.

It is not surprising that many Malays have retired from this unpleasant work. The height of the palms poses considerable danger, and the thatch at the top is often full of scorpions, bees and even snakes. "If Allah wanted me to go up that tree," one Malay told me, "he would have given me the fur and feet of a berok."

Macaques have become as crucial to the success of the country's coconut harvest as Hanuman was to Rama. About seven years ago the need for them was so critical to local coconut production that authorities in Trengganu gave young monkeys away to anyone who would train and use them. Today, virtually every kampong on the coconut fringe of the Malay Peninsula's east coast depends on working beroks.

"The coconut is essential to our life," explains Zuraina Majid, a Malay anthropologist. "We drink coconut water, cook with its oil, and make cakes and sauces from the meat and milk." That isn't all. Fermented coconut tree sap, toddy, is a popular beverage. Medicine, soap, fuel, rope, dye, yeast, fertilizer, corks, cups, bowls, musical instruments, decorations and jewelry all come from the coconut palm.

It can take weeks for Tahar (on beach) to teach a monkey to pick, even longer to build a friendship.

Ripe, brown coconuts are worth $5 to $15 (U.S.) per hundred, and green ones (used for a growing market in coconut water) sell for a minimum of 25 cents each. In a country where the average per capita income is about $1,800 a year—and far less than that in the kampongs—coconuts can account for up to 50 percent of a family's income.

To understand how much having a coconut berok can mean to an individual, I visited the home of Azimi bin Zakaria in Pantai Melawi. Azimi and his 62-year-old father, Zakaria, are fishermen. Like other adult males in their village, they own small boats, but frequently, rough seas keep them from catching enough fish to

Author Randall Peffer teaches at Phillips Academy in Massachusetts. His leg still bears scars from his first encounter with a monkey at a Florida roadside zoo.

When Cheh grows too old to climb, he will still live under Tahar's stilt house and be taken care of.

feed themselves and bring money to the kampong.

"Many of us keep a monkey or two," says Zakaria, "they can work almost anytime." Azimi nods. As he sits on the steps of his stilt house, a young berok plays peekaboo among the folds of his sarong. From time to time, the monkey grabs the young man's hands or tumbles about doing flips and somersaults. "Thick fur helps protect him from bees and ants," Azimi explains, as he shows off the youngster's double coat of hair.

"Some people think the monkey is a pet for the Muslim Malay, because the Koran forbids us to keep dogs. But that isn't true," Zakaria goes on. "Our beroks are companions and partners, not useless pets." Zakaria suggests that the bond between a man and his berok cannot evolve in a week or a month. The trust grows slowly, but once established, except for flare-ups of temper, there is almost nothing the animal would

From teacher-partner Pak Long Pin, young berok gets a beginner's lesson in how to twist coconut off stem.

not do for its owner, and vice versa. Zakaria tells of one who flew at a wild dog to protect him from attack, and several times his beroks have shrieked in alarm, alerting him to poisonous snakes. In return, he nurses his monkeys. When one of his mature females broke her leg in a fall last year, Zakaria splinted it and fed her like a baby for weeks.

"Choosing a good monkey is like selecting a mate," says trainer Ibrahim bin Abdullah. "The big males are best for picking from tall, full trees, where the work is hard. But the males can be difficult to manage; they are strong and have large canines. Young beroks and females are easier to work with but not always as productive." Zakaria looks for a monkey with a big head, which to him is a sign of intelligence; he also believes playfulness indicates a good worker.

Beroks are a protected species in Malaysia; a special license is necessary to capture them. According to the country's Department of Wildlife and National Parks, and the World Wildlife Fund—Malaysia, the berok population there is not in danger, but I found that monkey owners and government officials alike were rather vague about where the coconut beroks came from and how they were caught.

"We buy them from a kampong in the jungle," some say, or "I think they capture them with a net or a trap." The impression conveyed is that people are hiding something—and they are. Off the record, government wildlife managers and coconut pickers admit that not all monkey hunters go to the trouble of getting a license. The methods of "capturing" the monkeys aren't always humane. Some hunters shoot nursing mothers in order to get babies to sell to dealers who trade with coconut pickers. Dedicated monkey handlers find the

Hanuman carries Mountain of Healing Herbs in illustration from 16th-century version of *Ramayana.*

illegal and violent capture of beroks revolting to think about and contrary to their Muslim beliefs.

"The berok should not bear the mark of cruelty," says Tahar bin Embong. "We owe him only our patience and kindness."

"He is my hands," explains 71-year-old Hajee bin Endut. "But maybe I need him more than he needs me." Hajee begins his day sharing a bowl of rice and cup of coffee with his berok. He treats the monkey almost like a child. Such sentiments, as well as the shortage of beroks for sale, have prompted many trainers to look for gentler ways to get their young animals. "There are more female coconut monkeys being trained," a wildlife official told me. And a few trainers are now breeding the macaques.

One day Hajee bin Endut and his berok Soo demonstrate how a monkey is trained. First the man clips the monkey's wire collar to a leash, holds him close and dangles before him a ripe coconut on a stem. Hajee spins the coconut with his hands and shows the berok how twisting the coconut will make it fall. Next the trainer places the monkey's hands on the coconut, and the monkey imitates what he has just seen. The coconut drops. At the end of the training session, Hajee cuts open the fruit and shares it with his trainee.

On day two, the coconut is tied to a low tree. The exercises of the day before are repeated, but this time the monkey has to climb the tree. Successful plucking is rewarded with another coconut feast. The third day the monkey repeats the lesson and then follows his trainer to a tall palm. On the command "*gi*" (for "*pergi*"—"go") the berok climbs the tree, his long leash trailing down to the trainer below.

Hajee grunts as the monkey sorts through coconuts in various stages of ripeness. The tone of the trainer's voice changes when the berok finds a really ripe one.

"Ha, ha!" he calls out. That's it.

The monkey twists the coconut, and after a few seconds it falls. Hajee coaxes the macaque to pluck several more before tugging on the leash, the signal to climb down. They harvest one more tree, split a coconut and call it a day. After 20 days of practice the monkey is fully trained and can work five or six hours at a stretch with a half-hour break.

According to Fatima Busu, there is something almost theatrical about the work the monkey master and the berok do together. It is like watching a circus; there are acrobatics, danger and the drama of taming a wild animal. "And every once in a while a man finds a special monkey that will make the whole kampong pay attention and watch."

Tahar bin Embong's Betok is such an animal. When he isn't distracted by females, Betok has all the moves of Spiderman. On a good day he can pick as many as 800 coconuts and harvest an entire coconut grove. Unlike most other beroks, Betok nearly always jumps from the top of one palm to the next, seldom coming down to the ground.

Watching this monkey tear through the tops of 80-to-100-foot palms, throwing down coconuts like rain during a typhoon and making 30-foot leaps through the air, is something to stir the earthbound watcher's blood. Sometimes Betok seems to play to his audience. After an especially dramatic leap he perches on a palm frond and lets out a loud "Mwaa," shaking the palm fiercely.

"Look at him," laughs someone watching as the berok poses like Rambo. "Hanuman, Bravest of the Brave." But the onlookers also know and appreciate that Betok has already picked $40 worth of coconuts—quite a contribution to the kampong's earnings.

The leash curves down through the air to Tahar's hand, and in the bright afternoon sun it looks like a thread of gold.

Silhouetted against darkening sky, man and macaque head toward the top of one more coconut palm.

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Islamic paintings at the Sackler enchant the eye

The legendary collection of Parisian jeweler Henri Vever was believed lost; now, after a lucky turn of events, the Smithsonian owns it

It all started at a dinner party in Paris four years ago. Laure Lowry of Williamstown, Massachusetts, was introduced to François Mautin, a delightful gentleman of about 80. At one point their conversation turned to the Smithsonian Institution, and Mrs. Lowry said she was sure that her son, who worked there, would be honored to show Mautin around. He mentioned that his grandfather had been Henri Vever, a prominent jeweler and Art Nouveau designer in Paris around the turn of the century.

It's a name well known to historians of Asian art. Only three months earlier at the Smithsonian, Glenn Lowry (Laure Lowry's son) and Milo Beach had discussed works they would eventually like to acquire for the new Arthur M. Sackler Gallery. High on their wish list was a collection of paintings, manuscripts and leather bookbindings, most of them from 11th- through 18th-century Persia, that had been amassed by Henri Vever. But the two curators never expected to see these works; the collection had dropped from sight during the turmoil of World War II, and it was widely believed to have been destroyed.

Mrs. Lowry's phone conversation with her son upon her return from France will undoubtedly go down in family lore. "I started to tell Glenn about François Mautin," she laughs; "but I have a terrible memory for names. So I told him, 'You must meet this man; I can't think of his name at the moment, but he's the grandson of Henri Vever.'" There was no answer. Finally she asked him, "Glenn, are you still on the line?"

In short order both Glenn Lowry and Milo Beach met Mautin and learned not only that he had inherited the collection, but that he would be interested in sell-

A Reclining Prince was painted in Tabriz about 1530. Characterized by a rich combination of opaque watercolor and fine gold, such works appealed to the jeweler in Vever, who acquired this picture in 1913.

Illustration opposite was once bound in 15th-century version of the *Shahnama* (Book of Kings), an epic about the early history of Iran's rulers. In this lively scene champions duel to decide outcome of a stalemated war.

ing it if it could be kept intact. Since shortly after the war it had resided, crated and incognito, in a New York City warehouse. When Beach and Lowry finally examined the works, they were the first scholars to lay eyes on them in almost 50 years. The result: in 1986, the Smithsonian purchased the entire Vever Collection for $7 million, the largest amount the Institution has ever paid for an acquisition.

Most of the paintings in this collection—in fact, most Persian paintings—were originally illustrations in bound texts produced for wealthy patrons. This is because the Arabs, who conquered Persia (now Iran) in the seventh century, were Muslim; and although their religion discouraged figural art, increasingly it showed up in secular contexts, particularly books. Among the most popular texts were versions of the *Shahnama* (Book of Kings), an epic poem that celebrated Persian history from the earliest mythical rulers up to the fall of the Sasanian empire. These and other texts became available on the European market as Iran fell into disarray during the 19th century; dealers often sold pages individually to maximize profits.

An exciting climate for collecting

Henri Vever's diary provides fascinating insights into his life. He kept a close eye on his jewelry business, frequently visiting the gem cutters, enamelists and goldsmiths who worked for him. One of his favorite solitary pastimes was early morning bicycle rides in the Bois de Boulogne. He writes of privately arranged meetings and huge expositions where enterprising art dealers introduced collectors to prints brought from Japan, ancient bronzes from China and illustrated manuscripts from Persia. He frequently gathered with friends to discuss new acquisitions (". . . Gillot has just telephoned me to come immediately and to bring my beautiful Persian book. . . . [he] gets extremely excited to see the animals which are painted in the margins and which are not natural at all").

The pictures reproduced on these and the following pages are a sampling of 150 works from the Vever Collection that are now on view at the Sackler Gallery. "A Jeweler's Eye: Islamic Arts of the Book from the Vever Collection" will run through April 30. Also, on March 1 the PBS television series *Smithsonian World* will tell the story of Henri Vever and his collection.

As a designer of jewelry, Vever spent hours studying gems, enamelwork, gold inlay. The works on these pages, with their precision of line, brilliance of color and elegant depiction of scenes—small yet filled with detail—are about as close to jewelry as painting can get. Which helps explain why Vever appreciated them so much—and why great collections don't just happen.
Constance A. Bond

Seated Princess (top) is the central figure of an album page painted around 1600. The close-up (above) illustrates the intricate—and clever—delineation of her garment: the area shown is only two inches wide.

Detail of page from a 15th-century *Shahnama* shows Rustam, a heroic warrior, encamped; this version may have been painted in India. The blue formations in the background represent mountains, not water.

After battle, a defeated king is brought on foot before the victor, who orders that he be cut in half.

This page and seven others from a 1335 *Shahnama*, sold to Vever by Georges Demotte, are heart of collection.

Illustrations from three Persian texts run the gamut from violence to lyricism. At left, in scene from a copy of the *Shahnama* painted in 1518, the hero Rustam removes a demon's heart and liver, which are needed to restore the eyesight of his king. Below, a wise old man arranges the meeting in a palm grove of two tragically separated lovers—the children of rival clans—in a painting from a copy of the *Khamsa* of Nizami done about 1470. Opposite, in a painting from a *Falnama* (a book of divination that includes folktales and popular stories) from around 1550, a fire-breathing demon descends upon an unfortunate horseman.

Persian artists often exercised a subtle sense of humor in their depiction of animals and even landscapes; close examination of the rocks in the painting at the left, or of the trees on the facing page, will yield charming rewards.

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As epidemic spread, Iowa State University turned its gym into a hospital ward full of flu patients.

By Jack Fincher

America's deadly rendezvous with the 'Spanish Lady'

In 1918, while the war in Europe still raged, we found ourselves fighting a killer flu for which there was no cure

The brothers stood in the cooling dust of an East Texas autumn, hitting each other as hard as they could. Murlin, two years younger at 16, had struck first. Wright was their widowed father's favorite, and Murlin was sick of it. Yet with their little brother, Neal, looking on, it seemed somehow fitting that Wright should strike the last blow, battering Murlin, dazed and bloody, to the ground.

Wright, dreading what their stern sheriff father might do to punish him, did what many a young man has done to escape an unhappy household. He ran off and joined the Army. A few days later word reached home from the camp in Dallas: come at once, your son is gravely ill. His father found him lying unconscious on the cold stone floor of a makeshift military hospital, its exhausted staff too overworked by the influenza raging round them to notice. Wright died on October 18, 1918.

Murlin was so guilt-stricken at his brother's death that he never talked about it. I know. Murlin was my father. Only after he died did my cousin tell me the story. At that, it was but one small, sad design in the vast tapestry of a fatally infectious disease as common to the fabric of American family life then as it is rare today. Times were so different then. Grown-ups and

children were so quickly subtracted from the world by so many diseases that we no longer have to fear. My grandmother, for instance, died before Wright. She sewed her tubercular sister's burial shroud and then died of the disease herself. Her youngest son was born tubercular. He died before his mother.

For millions of people fortunate enough to have escaped the horrors of World War I, the plague struck as the fighting neared its end and displaced war as the tragic centerpiece of everyday life. It was known as the Spanish flu and it spread worldwide. In just under a year, starting in the spring of 1918, it killed more than 22 million people, at least twice as many as died in the "war to end all wars." Some estimates, including people who died of complications, go as high as 30 million.

Trying one of many hygienic methods suggested for warding off flu, Army recruits gargled every day with salt water.

In America, with curiously little fanfare, the flu brought to death a half-million souls, five times as many Americans as died in combat in France. How we tried to cope with the flu and its side effects became what historian Alfred Crosby calls the "greatest failure of medical science" ever.

"Never before," an article in *Science* magazine stated in 1919, had there been "a catastrophe at once so sudden, so devastating and so universal." Describing 1918 here at home, a nurse from Milwaukee said that it was the "year men cried."

The first mild wave of the epidemic began in March 1918 when a mess cook with chills and fever reported for sick call at Fort Riley, Kansas. Pvt. Albert Gitchell said his head and muscles ached and his throat felt sore. By week's end there were 522 such hospital admissions at the fort. Despite the quickening effect of fever, vital signs including heartbeat were slowed by a profound systemic depression. Doctors were puzzled. Disturbing, too, the illness seemed to hit hardest among robust people in their 20s and 30s, a period when resistance is normally high.

Yet nobody seemed terribly worried at first, not even when a dozen other overcrowded camps were struck. Military authorities and the government were still concentrating on how to get enough fresh troops to France, where Gen. John J. (Black Jack) Pershing was planning the first American offensive, one that everyone hoped would end the war. Besides, flu had been around since Hippocrates first noted a probable Athenian epidemic in 412 B.C. Centuries later, the Italians christened it *influenza di freddo*, "influence of the cold." Still later it came to be believed that some "vicious quality" or sudden shift in the atmosphere mysteriously communicated the disease to whole areas. Fort Riley was a famous cavalry post, and right before the outbreak, it had experienced just such an atmospheric change when gale-force winds shrouded the camp with a noxious pall of prairie dust and stifling smoke from burning horse manure.

During the early stages, flu struck hardest in crowded Army camps.

But exactly what was communicated nobody knew. In fact, though flu shots are of some preventive help today, there is still no known cure for most of influenza's many forms. In 1892, Germany's Richard Pfeiffer thought he'd found the answer in throat cultures of flu patients in Berlin: a blood-nourished bacillus—a rod-shaped bacterium—one-sixteenth the size of a red corpuscle. Other medical researchers weren't so sure. They suspected the existence of invisible microorganisms—viruses (SMITHSONIAN

Ernest Hemingway

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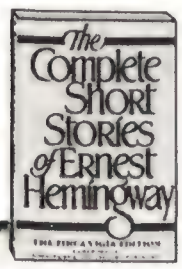

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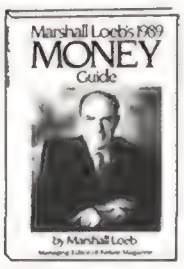

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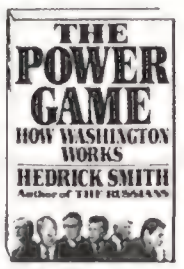

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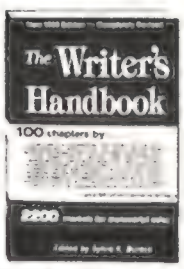

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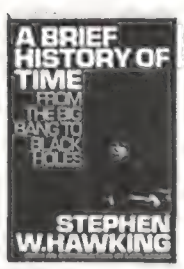

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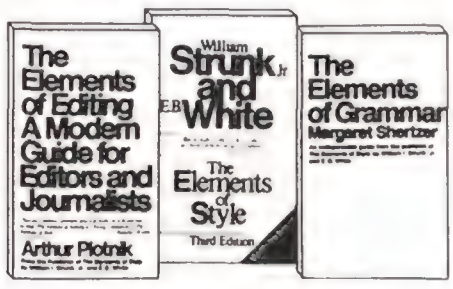

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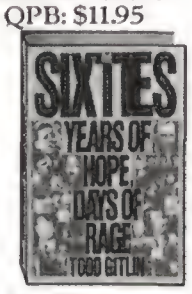

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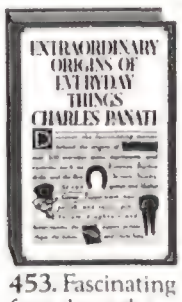

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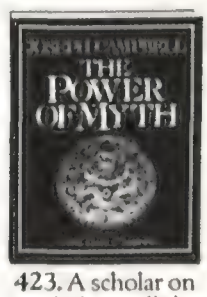

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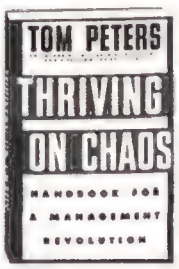

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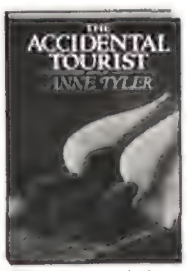

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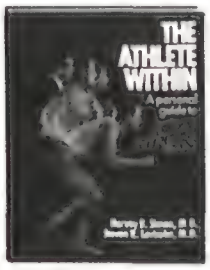

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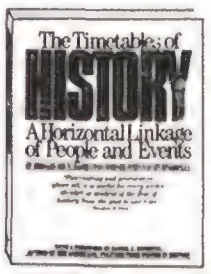

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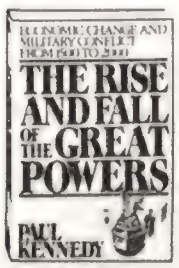

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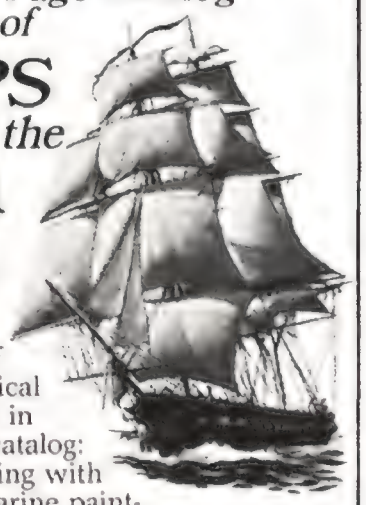

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November 1987). But nobody had really pursued this early lead. Why should they have? Flu ranked a distant tenth among the world's causes of death and aroused little concern compared with dread diseases like diphtheria. By and large, too, its initial symptoms in 1918 produced a relatively mild and apparently temporary condition of the kind that used to inspire the old medical school quip, "Quite a godsend! Everybody ill, nobody dying."

People were used to death in 1918, not only at the distant fighting front but in crowded training camps. The 46 deaths that followed at Fort Riley were simply attributed to the complications of pneumonia, and the Army quickly went back to training two million men under crowded conditions and shipping them across the North Atlantic. Often they were packed into airless freighter hulls, floating test tubes for breeding virulent, improved mutations of an infection whose only constant, epidemiologists would learn to their dismay, was change. By the summer of 1918, when the latest batch of U.S. troops landed in France, plenty of flu got off with them.

By fall, vomiting, dizziness, labored breathing and profuse sweating were added to the previously mild symptoms. Sometimes purple blisters appeared on oxygen-starved skin. Projectile nosebleeds from pulmonary hemorrhages occurred, too. Victims often went into paroxysms of coughing, spitting out pints of yellow-green pus. Flu victims began dying in larger and larger numbers, some violently within a few days, their lungs, so doctors said, occasionally resembling "melted red currant jelly."

In New York City even policemen had to wear masks on the beat.

From France this second wave of flu spead west to England and south to Spain where it killed eight million Spaniards, which is how it came to be known as Spanish flu, and even, ungallantly, "Spanish Lady." It was called *Blitz Katarrh* when it struck eastward into the ragged ranks of the Kaiser's army in Germany, and as Konrad Adenauer, then Mayor of Cologne, put it, leaving thousands "too exhausted to hate." On it swept, to Russia, China and Japan; down to South Africa and across to India (where 12 million people died of it) and soon to South America. The Spanish Lady's speed beggared belief.

Many vaccines were tried, to no avail. Here, Boston's mayor gets his shot.

The disease had already begun to produce far-flung horror stories. As Richard Collier writes in *The Plague*

of the Spanish Lady, one man in Rio de Janeiro asked another where the streetcar stopped, thanked him politely and fell over dead. On a Cape Town tram, seven riders, including the conductor and driver, collapsed and died within one three-mile stretch. And in the goldfields south of Johannesburg, Collier reports, an engine operator was hoisting a steel cage full of miners to the surface from deep underground when suddenly a shower of incandescent light detonated in his brain. He reached for the brake lever and froze, his hand rendered powerless to act. The cage kept going, banged against the lift's overhead frame, tore loose and fell back into the shaft, plunging 24 miners to their deaths. Flu exonerated him.

Among Americans the disease was primarily confined to the Army for several months. On September 3, 1918, a civilian case was documented in Boston. A week later, as Babe Ruth and the Red Sox beat Chicago in the World Series, three men dropped dead on the sidewalks of nearby Quincy. From Maine to the Gulf, from Florida to Puget Sound, fed by the mass movements of uniformed men and by their contact with civilians, cases began popping up first by hundreds, then by thousands. Statistics pyramided to roughly 10,000 domestic deaths in September. Up to 90 recruits a day were now dying at Camp Devens, Massachusetts, and Dr. William Henry Welch, the nation's most renowned pathologist, was called in to perform autopsies on bodies "blue as huckleberries." Afterward, shaken, he admitted a truth that the medical establishment hates to share with the public: "This must be some new kind of infection."

For the government and American medical authorities, it was crucial not only to find a cure and a preventative but to insure against possible public panic. Then, as it would now, the main official responsibility lay with the Surgeon General of the United States, Rupert Blue (right), a quietly competent 26-year career veteran, who had fought bubonic plague in San Francisco and yellow fever in New Orleans.

Today, the Public Health Service (PHS) is a far cry from what it was in 1918. Devastating infectious diseases like diphtheria, scarlet fever and smallpox have now all but been eliminated. The PHS now commands a yearly budget of $13 billion, a uniformed corps of 4,500 "shock troops" spread over all 50 states, and some 42,000 Civil Service doctors, scientists, technicians and administrators, not to mention such research installations as the National Institute of Allergy and Infectious Diseases, and the Centers for Disease Control in Atlanta, which have become so prominent lately in the struggle to control and cure AIDS. In 1918 Blue had only a relative handful of doctors and researchers to help him, and a yearly budget—even then regarded as a pittance—of less than $3 million.

Flu was not then a reportable disease anywhere in the United States, and many states did not even bother to file death statistics with the federal government—or to keep them at all.

Surgeon General Rupert O. Blue decided against quarantining.

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Since neither cure nor prevention were known, people tried all sorts of remedies. These boys wear bags of camphor to fend off the flu.

Because it was viewed as a common and usually mild disease, it was unlikely that Blue would have had the authority to impose a quarantine or to prevent ships carrying influenza cases from docking. The federal government was far less powerful and pervasive than it is today. Blue's office lacked not only funds but the necessary medical data to do much. He finally decided that it would be impractical to attempt a massive quarantine, a decision that, in retrospect, was probably wise.

And sanitary practices in those days were primitive. Restaurants scraped uneaten meat from their customers' plates back into soup stock, then stored it in grimy, germ-ridden iceboxes. In apartment buildings without plumbing, many tenants simply heaved their sewage into any nearby alley. In city slums and most rural areas, children slept several to a bed.

Jack Fincher writes frequently for the magazine. His uncle died during 1918 influenza epidemic.

Because of the war, which was America's first priority, more than a third of the nation's 140,000 doctors were in military service, and every day more were called up. Trained nurses were even scarcer. Some communities had neither. On October 11, Congress unanimously voted $1 million to cope with influenza; however, a bill to establish a PHS reserve corps was passed too late to do much, if any, good. Desperately, Blue set about recruiting physicians for the Volunteer Medical Service Corps, a backup organization for the PHS.

Eventually he also called upon the states to ban large gatherings. Contrary to political cartoons of the day (and even the *Journal of the American Medical Association*), Blue confirmed Doctor Welch's diagnosis. This bug was not your garden-variety influenza. This was some kind of relentless new killer.

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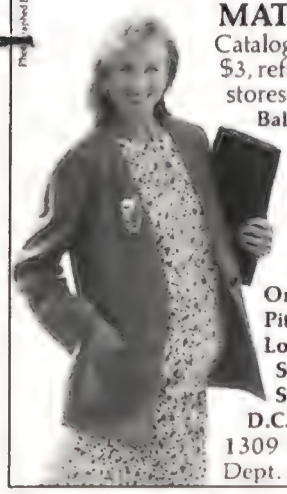

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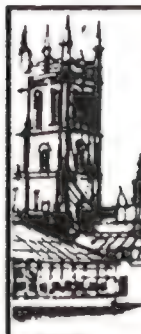

"Oh beautiful city...
steeped in sentiment as she lies,
Spreading her gardens to the moonlight.
And whispering from her towers
The last enchantments of the Middle Ages."
–Matthew Arnold

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Philadelphia and Seattle bragged that they need not worry—the flu would be kept at bay by their ideal climates. People were presented with a welter of official commentary and patronizing reassurance, much of it nonsense. A community doctor in Arizona, perhaps trying to keep the lid on panic, reported 50 fresh cases as follows: "all mild, four deaths." Mild? An *8 percent* death rate?

The New York City Health Commissioner, Royal Copeland, seemed hell-bent on single-handedly jawboning the epidemic into remission by blaming it on unsanitary Europeans. "You haven't heard of our doughboys getting it, have you?" he asked in airy disregard both of the evidence and the fact that existing rules of censorship forbade any such news from being published. "You bet you haven't, and you won't. No need for our people to worry." Copeland was not the only one who opposed Blue's flu alarms. In Missouri, one official even dismissed the flu as "Hun propaganda." Partly to avoid panic, mainly

Conductor turns away man because he is not wearing his anti-flu mask.

Today's forecast? Snow on the Matterhorn. Sun on the beach. Golf in the low 80's.

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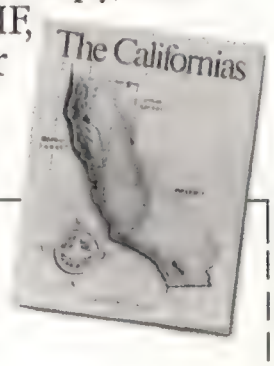

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In London, the double-deck buses were sprayed with disinfectant.

because it was overshadowed by the war, some newspapers tended to downplay the epidemic, just as the country would at first downplay the spread of AIDS.

In general, Blue's plea for enforced limitations on public gatherings to prevent spread of the disease fell upon ears deafened by the din of martial music. Thirteen million young men—ideal fodder for infection—were still jamming public buildings to register for the draft. In late September, a national subscription to finance the war effort got under way from coast to coast with mammoth rallies, parades and canvasses. In Philadelphia 200,000 marched; in San Francisco, 150,000. Did no one but the Surgeon General reckon the danger? Chicago did. After a rainy procession, tens of thousands were told to go home, shuck their wet clothes and take a purgative. Evangelist Billy Sunday joined the patriotic rush and dismissed the whole affair as a German ploy: "There's nothing short of hell they haven't stooped to do since the war began. Darn their hides!"

It wasn't long before the nation's thin, blue line of surrogate health officers started fining public spitters as well as handkerchiefless sneezers and coughers, and issuing calls for mandatory face masks. Sales and production of masks exploded. Workers wore them in offices and in factories, and in some cities you couldn't climb on a bus or a trolley without one. But there was plenty of heated argument and plenty of backsliding from people who didn't believe masks helped; or didn't like being told what to do.

And, as so often happened with the flu, tragedy was marked by comic oddities. A pair of newlyweds in San Francisco left an indelible impression on a young doctor friend by telling him they'd worn therapeutic masks—and nothing else—when they made love. In Tucson, Judge L. C. Cowan fined a window washer for removing his mask to blow the panes dry. Widely worn, masks probably were marginally helpful in the general way of hygiene and as a discouragement to intimacy.

As flu hopscotched around the country, the death toll mounted; from 2,899 in August to 10,481 in September to 195,876 in October; in the last four months of 1918, well over 300,000 died. Both sexes and all races were hit. Surprisingly, a general exodus failed to occur; the poor couldn't afford to run, and because the disease seemed

Paris sandwich men exhort citizens to whip the flu by wearing masks.

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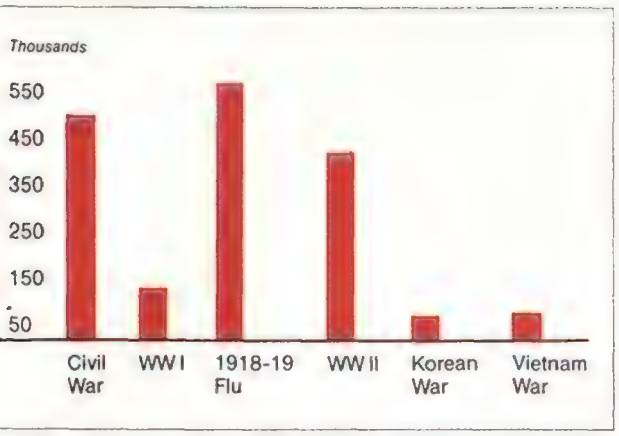

America's deaths from flu were greater than the number of U.S. servicemen killed in any war.

so quixotic, the rich never knew where to go to avoid it.

Historians still ask themselves how more than a half-million Americans could die in hardly more than ten months, in the most lethal internal convulsion since the Civil War (498,000 soldiers dead in four years), without laying a comparable mark on the country's psyche. But the astonishing truth is that during the epidemic few people were in a position to see the big picture, and not one of the few was actively in charge overall, though the resulting chaos, assessed in retrospect, would result in an expanded Public Health Service with an unexcelled reporting system. Moreover, only one man, President Woodrow Wilson, possessed the means to mobilize national consciousness. But except when the flu threatened to disrupt troop movements or hamper vital arms production, Wilson was far too busy prosecuting the "war to end all wars" to bother with a silent foe that ebbed and surged like wildfire, burning itself out here, moving on there. And where it concerned soldiers, this foe was often protected by the cloak of official censorship.

Not that any of that would have mattered in the end. For nothing helped, really. Cause and cure—transmission and prevention—all remained mysteries. Transmission? Almost surely airborne by human breath, but what a Pandora's box of potentially ill winds that was. Phone booths were padlocked and streets sprinkled; cashiers were equipped with finger bowls of disinfectant. Public places from dance halls, pool rooms and movie houses to libraries, schools and ice cream parlors, even red-light districts, were buttoned up. Churches and saloons were shut tight, too, though not without spirited resistance.

But controlling possible contagion on such a scale was virtually impossible. One sanitation officer counted 199 individual chances for exposure in any citizen's average day. Victor Vaughan, Acting Surgeon General of the Army, thought that ten daily contacts was more realistic, but even that number, if carried to a logical conclusion, could multiply to millions of infections a week.

At a West Coast Navy base, guards were ordered to shoot to kill anyone attempting to enter or leave without official permission. Drinking fountains were sanitized hourly by blowtorch, telephones drenched in alcohol. Draftees were given "close order drill," keeping a 20-foot interval. Yet such Herculean efforts were mocked

Evangelist Billy Sunday preached that flu was started by Germans.

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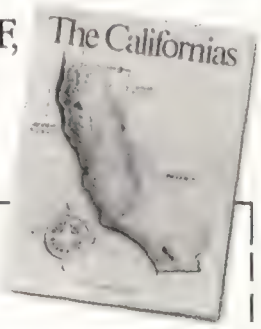

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Backed by grim statistics on infant mortality, directors of Women's Emergency Aid Corps enrolled nurses to fight flu.

by inexplicable immunities. Waterbury, Connecticut, suffered 753 deaths in one month alone. Milford, 20 miles away, escaped completely. In Montana, people were baffled by the relative lack of flu among butchers, Methodists and underground miners.

Prevention? There were plenty of vaccines. Illinois alone tried 18 different kinds without success. Across the land, doctors rushed to create prophylactic solutions. Certain he had located the best, the mayor of Boston ordered his secretary to carry a batch to San Francisco via the 20th Century Limited, a crack express train. Seventeen thousand Bay Area hopefuls lined up for doses despite widespread assertions that such "soups" offered nothing more than a sore arm. One wit claimed the popularity of the shots was simply a result of the spinach ethic—being so unpleasant, they must be good for you.

Cure? Today we know there was none, so understandably in 1918 the medical profession was baffled. Naturally, good old American home medicine bulged with all sorts of cures, from tiny doses of strychnine and kerosene to red-pepper sandwiches and something called Bulgarian blood tea. Nostrums ranged from the bizarre to the superstitious. As a preventative, people variously sprinkled sulfur in their shoes, wore vinegar packs on their stomachs, tied slices of cucumber to their ankles or carried a potato in each pocket. According to one belief, if you placed a shotgun under the bed the fine steel in it would draw out fever. In New Orleans, people bought voodoo charms and chanted, "Sour, sour, vinegar V, keep the sickness off of me." One Volunteer Medical Corps general championed "breathing through the nose, chewing food well, and avoiding tight clothes, shoes and gloves." One mother in Portland, Oregon, buried her 4-year-old girl from head to toe in raw, sliced onions. An appalled Chicago physician summed it all up as "polypharmacy run riot."

Cause? In some areas Pfeiffer's bacillus was detected almost daily in influenza victims, in other places it was absent altogether. Intrepid military volunteers were injected with 13 different strains of flu bacillus, had their throats swabbed with pulmonary secretions from the sick and allowed the inside of their noses to be painted with a broth of pure bacillus. Nothing happened. Indeed, in New York City an entire family of six was stricken, each member found to be infected with a different bacterium. It was chillingly ineluctable—as in the ditty recited on playgrounds everywhere:

> I had a little bird
> And its name was Enza.
> I opened the window
> And in-flew-Enza.

The tragic stories accumulated. Years later in San Francisco, Henrietta Burt, a secretary, would recall a fateful bridge game: "We played until long after midnight. When we left we were all apparently well. By 8 o'clock in the morning I was too ill to get out of bed, and the friend at whose house we played was dead." A stricken Congressman and his bride, clinically gowned and masked, were married at his hospital bedside; seven hours later he succumbed.

"Hunt up your woodworkers and cabinetmakers and set them making coffins," one health department was morbidly advised. "Then take your street laborers and set them to digging graves." Devastated Pennsylvania had learned the wisdom of that counsel through grim experience. In one week a total of 5,000 people died in Pittsburgh and Philadelphia. So overwhelmed was the latter city that 528 bodies piled up in a single day await-

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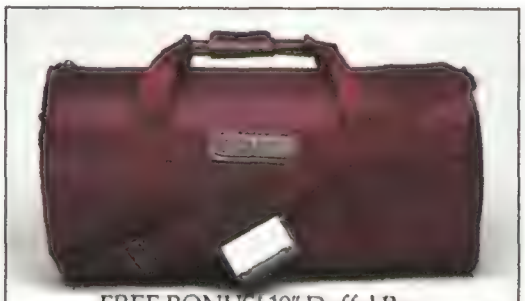

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With 25 million infected during the epidemic, it was hard to provide care for everyone. The Red Cross often worked around the clock.

ing burial. More lay beside the gutters or in rooming houses.

As fear spread, laws and law enforcement in some cities grew savage. In Chicago, charges of murder were demanded against landlords whose sick tenants died after their heat was turned off for nonpayment of rent. In New York City, 500 people were arrested for violating "Spitless Sunday"; doctors were fined for failing to report new flu cases.

Violence and vigilantism flourished. Strangers from notoriously infected states who got off the train in some New Mexico towns were told to move on. A Montana rancher intercepted a doctor on the road and forced him at gunpoint to treat his family. In *Memories of a Catholic Girlhood*, Mary McCarthy tells how her father drew a pistol on a conductor who was trying to shunt his ailing family off the train bearing them to relatives in Minneapolis. San Francisco's authoritarian, chief public health officer, who was a stickler for masks, was sent a bomb containing black gunpowder, buckshot and broken glass. Frontier justice may have reached some sort of zenith when Prescott, Arizona, made it a jailable offense to shake hands, adopting the proposal from an obscure Italian Fascist newspaper publisher named Benito Mussolini.

By mid-autumn, public services were crippled everywhere. Some shipyards working on war contracts reported that their employees were ill. In Pennsylvania and Kentucky, officials demanded that the Army send medical help to coal-mining towns to sustain the vital war effort.

For every 1 who died in the United States, an estimated 50 had the disease. Some took advantage of the pandemonium to steal or to seek oblivion in drink for weeks on end, but for the most part, as A. A. Hoehling wrote, "There were two principal categories of people: those afflicted with the disease and those who endeavored to save them."

All that could really be done, it turned out, was to keep the patient quiet, warm, fed and medicated against other life-threatening complications, but even that put a terrible

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burden on the people who were well, or though sick, still able to get about. Everywhere the call went out for anyone with two hands and a willingness to work. Helping their prostrate relatives, small children cooked, kept house, cared for and cleaned up after the sick. Some, like those of their elders unable to face the plague, wandered the streets in a daze. Minneapolis police set up a special search for parents of a hundred homeless youngsters found alone and hiding. In Chicago, a laborer crazed by the illness of his wife and four children screamed, "I'll cure them my own way!" and cut their throats. Families called the authorities to report the terminally ill, then quickly fled their homes in terror.

With churches closed, people prayed elsewhere, sometimes using rude outdoor altars as they did in Maine where a priest set up a table and a cross in a garage doorway, and worshipers knelt in the snow. Some deeply believed that the plague had been visited on the world as Divine punishment for human sinfulness. Acting Army Surgeon General Vaughan gave voice to a different, but statistically chilling, thought: "If the epidemic continues its mathematical rate of acceleration," he announced, "civilization could easily [disappear] from the face of the Earth."

Stretched to the breaking point and worked to exhaustion, doctors and nurses labored on. They pumped railroad handcars to reach isolated cases, made their rounds by horse and newfangled airplane. Not only did they treat whole families, they assembled and handed out food and blankets; they milked cows, cooked, built fires, heated water, and bathed and dressed the helpless. They grabbed meals from the family stew pot and fell asleep on the nearest couch. Or dozed upright in their buggies, warmed by heated bricks wrapped in newspapers as their horses were given free rein.

And gradually a kind of dogged selflessness, sometimes amounting to heroism, became commonplace. Businesses, hotels, fraternity houses, private clubs, even the exclusive Vanderbilt farm in Rhode Island donated their premises for emergency hospitals. Private automobiles and taxicabs, as well as the limousines of society matrons, chauffeured medics and served as ambulances. Off-duty police and firemen drove ambulances and carried stretchers. Department stores distributed relief supplies and opened phone banks so people could make emergency calls. Volunteers canvassed house-to-house searching for those too weak to cry out for help.

Fitfully, the long day's night began to fade. People who had the disease and survived, either by chance or because of care that prevented pneu-

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monia, the most common and most deadly complication, seemed to be immune from further episodes. Like a storm, the Spanish flu eventually blew itself out. On November 7, a false Armistice sent a million people streaming into the streets of Philadelphia to kiss and hug and dance in defiance of every public health tenet. When the real Armistice was signed four days later there was no holding back a war-weary nation. Factory whistles blew, church bells and fire bells rang, and in Chicago 16,000 police could not keep the joyous crowds from jamming together. A third wave of flu—harsher than the first yet milder than the second—was still to come by year's end. But as far as the people were concerned, the real crisis had passed. Psychologically, at least, the end of the war had upstaged it.

Despite panic, foolishness and even some blatant cowardice, historians tend to give the population full marks under fire: "To an amazing extent, enthusiasm was successfully substituted for preparation and efficiency," Alfred Crosby observes.

More than 25 million Americans were infected; perhaps a billion beings worldwide. Direct U.S. economic losses have been put at $3 billion, but an insurance industry expert calculated the influenza epidemic as an "actuarial nightmare," which would ultimately cost the United States alone *ten million years* in productive lives cut off in their prime. "Nothing else," writes Crosby, "no infection, no war, no famine—has ever killed so many in as short a period."

And yet, he adds, the influenza epidemic "has never inspired awe, not in 1918 and not since." There were isolated literary masterpieces like Katherine Anne Porter's short novel *Pale Horse, Pale Rider*, but many of the best-selling college history books in the United States fail to mention it and one understates the deaths by half.

As for the mysterious Spanish flu virus, it seemed to vanish from the planet as if it had never been. Since

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then there have been plenty of milder flus, of course. Today we know that influenza viruses have a genius for assuming new forms when an old one has run its course. The World Health Organization isolates each new flu strain, analyzes it and, if antibodies prove low in global population samples, annually modifies the effective, existing vaccine to combat what might otherwise become another universal contagion. It is tedious work, and even now there are no guarantees for the future. The existence of antibiotics, however, would probably minimize the number of deaths from complications such as pneumonia, which killed many of the victims in 1918.

As evolutionary biologist Stephen Jay Gould recently told an AIDS-lecture audience: "We've had a couple of generations of great fortune: since the . . . flu epidemic of 1918, there has not been a [lethal] pandemic disease that struck the human population. If you look through human history, a pandemic is everyday biology. With our usual hubris we felt that we'd learned through technological advances to be free of it forever. But we're not."

Rest in peace, Uncle Wright.

A masked nurse draws water from a hydrant for overflow patients housed in tents on the grounds of a Brookline, Massachusetts, hospital.

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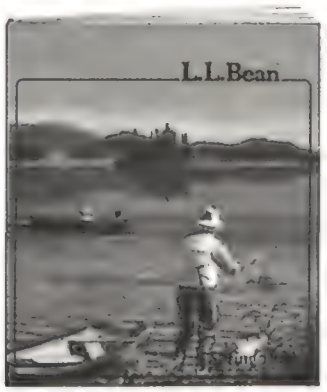

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Smithsonian highlights

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The Associates' Planning Packet is yours for the asking; call or send a postcard to Associates' Reception Center, Smithsonian, Washington, D.C. 20560; (202) 357-2700 or TDD for hearing impaired (202) 357-1729. Begin your visit at the Associates' Reception Desk, now located in the Arts and Industries Building.

Musical Weekend

Highlights of the 17th Musical Weekend, April 28-30, will include the Smithsonian Chamber Orchestra performing Beethoven on authentic period instruments; dinners at the National Portrait Gallery and the Museum of Natural History; luncheon at George Washington's farm; tea and music at the Chinese Embassy; and a champagne breakfast at the Air and Space Museum. To obtain additional information, write: Musical Weekend, Room 4124 NMAH, Smithsonian Institution, Washington, D.C. 20560.

Contributing Membership Program

The Contributing Membership supports the Institution's work in education, research and scholarship. Partially tax-deductible contribution categories are: Supporting, $60 (available only to non-D.C. area residents); Donor, $125; Sponsoring, $300; Sustaining, $600; Patron, $1,200; James Smithson Society, $2,000. Members enjoy special privileges including concerts and lectures nationwide, and foreign study programs. For more information write to the Contributing Membership Program, 1100 Jefferson

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Special January exhibits and events

Anacostia Museum
Inspiration: 1961-1989 (January 15-March 5) See *Highlights continued*, page 151.

National Museum of African Art
Kalabari Ancestral Screens: Levels of Meaning and *Echoes of the Kalabari* (through January 29) Perspectives new and old on Nigerian culture.
Royal Benin Art Creations from court artisans, 15th through 19th centuries.

National Museum of American Art
Perpetual Motif: The Art of Man Ray (through February 20) Major retrospective on a founder of Modernism.

Arthur M. Sackler Gallery
A Jeweler's Eye: Islamic Arts of the Book from the Vever Collection (through April 30) Some 150 paintings and manuscripts from the Parisian jeweler's magnificent trove (see page 122).
Japanese Art: Recent Acquisitions (through March) A palanquin, screens.

Hirshhorn Museum & Sculpture Garden
Gerhard Richter (through February 12) Eighty paintings, objects, photographs by the contemporary German artist.
Directions: Walter Pichler (through January 22) The Austrian artist's fantastical drawings.
Krzysztof Wodiczko: WORKS (through January 22) Videotape by the Polish-born artist. See *Around the Mall*, page 24.

National Museum of American History
Trees of Christmas (through January 8) Eleven spruce and fir trees decorated with handcrafted ornaments.
Sports Feelings (through February 5) First joint exhibit of American and Soviet sports photography.
The American Presidency, 1789-1989 (through June) More than 400 objects and photographs.
Commemorating New Sweden (through January 31) A 350th-anniversary look at the Swedish settlers and their neighbors.

National Museum of Natural History
Flowers from the Royal Gardens of Kew: Two Centuries of Curtis Botanical Magazine (January 26-April 30) Watercolors and memorabilia chronicle the history of the renowned periodical.
A Celebration of Flowers (January 27; noon) Keeper, Kew Gardens, Grenville Lucas, on botanical illustration.
Crossroads of Continents: Cultures of Siberia and Alaska (through April 2) First jointly curated Soviet-North American exhibit ever.
"Coyote": A Myth in the Making (through March 21) The works of American Indian artist Henry Fonseca.

International Gallery
S. Dillon Ripley Center
Threadworks: Miniature Textile Work (through January 8) Creations by 19 American artists (SITES Gallery).

National Air and Space Museum
European Space Agency (through January 31) Recent scientific missions.
Focus on Flight (through April) Forty photographs from the NASM contest.
Mission: Planet Earth (January 26; 8 P.M.) John McLucas, chairman of NASA's Advisory Council, urging a thorough study of our threatened geosphere.

Cooper-Hewitt Museum (New York)
Enamel Signs (January 17-April 9) More than 80 European promotion placards.
Purses, Pockets, Pouches (through March 5) Textiles, 17th to 20th centuries.
Courts and Colonies: The William and Mary Style (through February 12) Dutch, English and American decorative arts.

Renwick Gallery
Stephen de Staebler: The Figure (through February 12) Thirty-five pieces.

Exhibition catalogs

Perpetual Motif: The Art of Man Ray (paper, $25.95; cloth, $55)
People of the Tropical Rainforest (paper, $19.95; cloth $39.50)
Air Combat Paintings of Robert Taylor (cloth, $45)
Crossroads of Continents: Cultures of Siberia and Alaska (paper, $24.95; cloth, $45)

To order, send check or money order to Museum Shops, Box 44083, Washington, D.C. 20026-0083. Include 15 percent of total purchase to cover postage and handling (minimum, $1.75).

Smithsonian on the air

Radio Smithsonian: Features include stories on women in U.S. and Soviet space programs, Disney's Mickey Mouse, and mapmaking.

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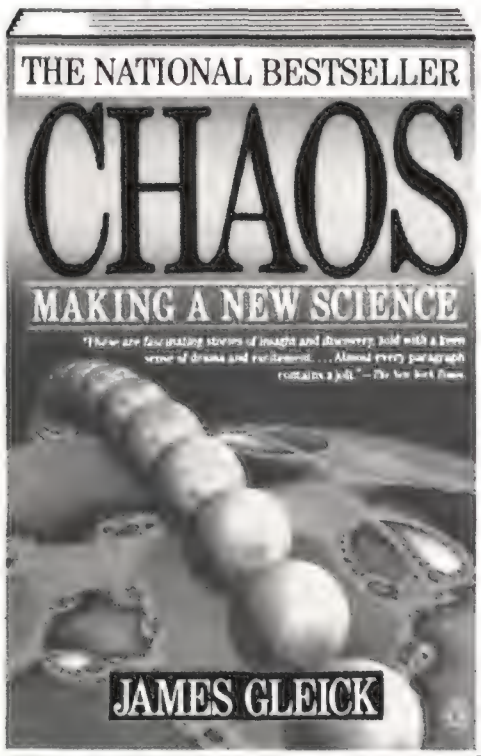

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Here at the Smithsonian: Three-minute presentations take you behind the scenes at museums and related activities. To find out what stations in your area carry these radio and TV programs, write: Office of Telecommunications, MAH Room BB40, Washington, D.C. 20560.
Smithsonian World: The new season continues with "Web of Life," an examination of the quest to understand the genetic basis of life on Earth; January 25, 8 P.M. Check local PBS listings.

Lecture and Seminar Program

For further information on offerings around the country, write to the Lecture and Seminar Program, 1100 Jefferson Drive S.W., Room 3045, Washington, D.C. 20560; (202) 357-1350.

Resident Associate Program

To become a Resident Associate, or for fee and ticket information, call 357-3030. Here are some January events:
Marvelous Moiseyev! (January 24, 8 P.M.) *New York Times* dance critic Anna Kisselgoff on the renowned folk dance company, in anticipation of the troupe's Washington performances.
Odetta with John Cephas and Phil Wiggins (January 13, 7:30 P.M.) A concert ranging from folk music to gospel and the blues.

Smithsonian Institution Traveling Exhibition Service

SITES organizes and circulates exhibitions to cities throughout the United States and abroad. To sponsor a show in your community, write SITES, Smithsonian, Washington, D.C. 20560. Here are some January exhibits:
Fairbanks, Alaska (January 21-February 19) *A Collector's Eye: The Olga Hirshhorn Collection*, University of Alaska Museum.
Fullerton, California (January 7-February 5) *The Art of Botany*, Fullerton Museum Center.
Hanover, New Hampshire (January 21-March 12) *African-American Artists, 1880-1980*, Hood Museum of Art.
Logan, Kansas (January 21-February 19) *Child to Child: American-Soviet Children's Art Exchange*, Dane G. Hansen Memorial Museum.
Palm Beach, Florida (January 6-February 5) *A Russian Impressionist: Paintings and Drawings by Leonid Pasternak, 1890-1945*, Society of the Four Arts.

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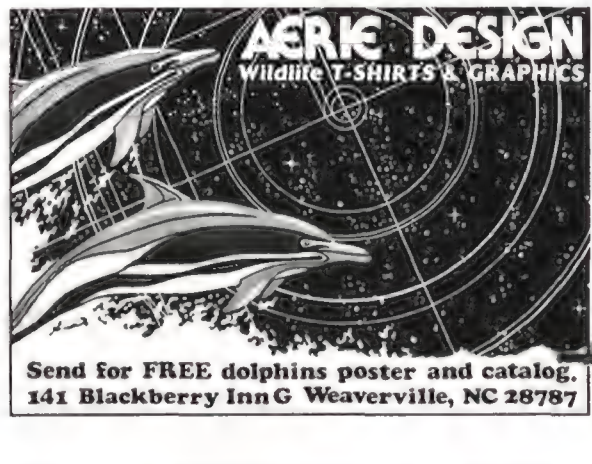
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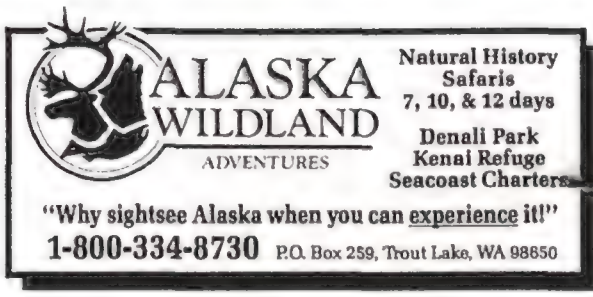

Across generations, a creative legacy

In the early days, they were a handful of colleagues, meeting together, sharing ideas, discussing techniques, forging a fledgling community of Afro-American artists. Since those 1960s gatherings in Howard University's art department, the District of Columbia Art Association has grown to serve the community in many ways.

"Inspiration: 1961-1989," the Anacostia Museum's retrospective look at the work of 34 DCAA members, recalls nearly 30 years of creative accomplishment. The artists, all of them ranging over time and distance in pursuit of particular visions, have drawn on travels in Latin America and the Caribbean, ramblings through downtown Washington and sketching forays into rural New England. Accumulated wisdom and freshness of perspective are represented here: contributors to "Inspiration" range in age from their 20s to their 80s.

These assembled works, as the show's organizers write in the accompanying catalog, encompass a rich tradition: "As preservers of a past culture and as builders of the present, we have created a remarkable heritage."

The exhibition will continue at Washington's Anacostia Museum through March 5, 1989.

Kathleen M. Burke

Betty Murchison's *Erin and Leah* is the artist's portrait of granddaughters.

In her 1980s collage *Street Scene III,* Edith Strange evokes "any American city."

Summers on Martha's Vineyard inspired Delilah Pierce's *Nature's Symphony.*

Lois Mailou Jones painted *Jeune Fille* during a sidewalk sketching session.

William Dorsey made study sketches for *Maid in Brazil* during sojourn in Rio.

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Big Bend, Texas March 22-31: Hiking in the park, and a visit to McDonald Observatory.

Sojourn in Tucson April 1-8 or 15-22: Folklore and natural history.

NEW Charleston and Savannah April 2-9: History, homes and gardens.

NEW Renaissance Miami April 5-10: Culture, art and architecture.

Delta Queen April 6-14: Mississippi steamboat journey from New Orleans to Memphis.

Spring Gardens April 30-May 7: From Washington, D.C. to Wilmington, Delaware.

Okefenokee May 2-7: Canoe through scenic wildlife refuge; for novice or expert.

Southwest Indians May 4-14: Hopi and Navajo from Phoenix to Santa Fe.

NEW Brooklyn with a Bang May 25-28 or September 14-17: Architecture, art.

Sanibel-Captiva May 28-June 3: Flora and fauna on Florida's Gulf Coast.

NEW Detroit Auto Barons June 8-11: Visit the estates of Ford, Fisher and Dodge.

Alaska Landscapes June 20-July 2 or July 25-August 6: Denali National Park and more.

Yosemite July 13-22: Easy naturalist-led hikes through spectacular scenery.

Alaska Cruise August 12-23: From Ketchikan along the Inside Passage.

Foreign Study Tours

People's Republic of China Ten tours in 1989 for new and repeat travelers.

Kenya-Tanzania Wildlife Safari January 26-February 12: Unique journey to East Africa.

NEW Jamaica February 26-March 8: Customs, culture, visual and performing arts.

NEW Budapest Music Festival March 15-26: International musical performances.

NEW Sea of Cortez March 19-28: Blue whales and wildlife off Mexico's west coast.

Kyoto March 26-April 4: History, art and culture. Includes Nara.

Atlantic Passage April 10-26: Cruise from the Caribbean to West Africa—cultural and natural history.

Berlin April 12-26: Also features Dresden, Wittenberg, Weimar.

European Countryside Programs May-September: Relaxing sojourns in scenic and historic areas of Hungary, England, Austria, France, Italy, Switzerland, West Germany or Wales.

NEW Botswana-Zimbabwe May 9-26: Includes Victoria Falls and Okavango Delta.

Danube Voyage May 23-June 9: Cruise from Romania to West Germany aboard the *Theodor Körner*. Study the art and history of countries linked by this major waterway.

NEW Cotswold Walks May 25-June 6: A variety of walks through the English countryside.

Central Asia May 27-June 8 or September 16-29: From Leningrad, fly to Samarkand and Bukhara. Ends in Moscow.

Florence Seminar May 27-June 11: Classes and excursions based in a villa-hotel.

Greece May 29-June 12: History and art from Thessaloniki to Athens.

Odyssey of Flight June 2-13: Paris Air Show and 45th anniversary of D-Day.

Highlands of Scotland June 2-18: Highlands culture and natural history.

NEW Turkey's Eastern Reaches June 7-24: East from Ankara to the ancient Orient.

Poland June 9-25: History and culture in Warsaw, Kraków and other cities.

British Isles Voyage June 16-July 3: Remote hamlets and islands aboard the *Argonaut*.

Cave Art in France and Spain June 19-July 4: Basque coastlines, the Pyrenees, Dordogne.

Swiss Countryside Walks June 21-July 6: Moderate or challenging day hikes.

NEW Canada-St. Lawrence June 22-July 3: Montreal, Quebec, Toronto as well as a cruise on the *Canadian Princess*.

Walks in England's Lake District June 29-July 12: Natural and cultural history.

Scotland by Train July 1-14: Skye, Glasgow, Edinburgh, Inverness, the Highlands.

NEW England for All Ages July 10-20: Storybook London and the Cotswolds for families with children and grandchildren (ages 7-14).

Iceland July 22-August 6: Explore the island, study natural history, geology.

Baltic Passage July 28-August 12: Cruise to Denmark, Sweden, Finland, Leningrad.

NEW Lena River USSR July 28-August 16: Exclusive cruise through Siberia.

NEW Voyage to Sumatra and Java August 1-17: Includes Singapore, Jakarta, Borobudur.

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Hot Springs, Virginia, January 23-27
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The Broadmoor
Colorado Springs, February 22-25
Learn about aviation history and visit the Air Force Academy, or study American popular song in spectacular surroundings at the base of the Rockies.

Mohonk Mountain House
New Paltz, New York, April 2-7
Enjoy courses on Victorian art and architecture or on mythology at this unique, lakeside 19th-century resort.

Washington, D.C. April 18-21
Study Persian and Islamic art during lectures and tours at the Sackler Gallery. Or, learn about American coins and currency at the National Numismatic Collection.

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Archaeology of a 17th-century Spanish Mission, Gainesville, Florida
February 19-March 3
Survey building remains and excavate both Hispanic and Indian artifacts from a Franciscan mission site.

Competition in the Forest
Front Royal, Virginia
March 11-25 and June 3-17
Track, observe and record the behavior of mammal and bird populations at the Smithsonian's Conservation and Research Center.

Dynamics of an Active Volcano
Costa Rica, April 1-13
Monitor Arenal Volcano's eruptive activity and study the effects of volcanism on the surrounding vegetation.

Documenting Our Veterans Memorials
Washington, D.C. May 24-June 7
Join with Smithsonian photographers to record Memorial Day ceremonies at the Vietnam Veterans Memorial and other military monuments.

American Sculpture Inventory
Washington, D.C. June 4-16
As you survey statuary and relief works in the nation's capital, help establish the first nationwide survey of American sculpture.

British Enterprises in the New World
London, June 18-30
Conduct research on Caribbean colonization in London's libraries and museums for a new Smithsonian exhibition.

Creating Aerospace Curricula
Washington, D.C. July 9-21
Teachers (K-12) write innovative curricula for national distribution.

Air and Space Archival Treasures
Washington, D.C. July 23-August 4
Help archive historic documents and films at the Air and Space Museum and the Paul E. Garber Facility.

The Horse in Crow Indian Culture
Billings, Montana, August 15-22
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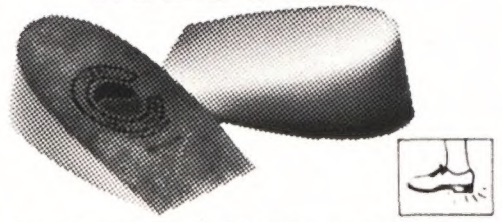

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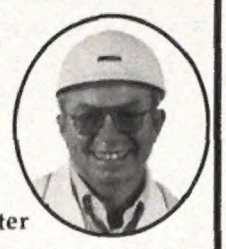

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By John Skow

Having all the answers is a hard row to hoe

It gets harder and harder, being the Answer Man. In the old days, when I got out of the Answer Academy, there were questions like "What is the largest city in North Dakota?" Easy: too-far-to-go. Ergo, forgo North Dakota. And, "What do you do for termites?" A snap: serve them little wooden sandwiches.

Then about 20 years ago, I guess it was, the world got more complicated. There would be posers like "My son would be six foot six, if he ever stood up, but he just lays around looking dazed. Do you think his brain is working too hard pushing that long hair up out of his skull?" Or, "I went to a restaurant and they had raw fish. What are you supposed to do?"

I could handle those. I told the guy with the numb son to buy the boy space boots. Those are the dinguses that let you hang upside down for hours, like a wombat. That way the boy's brain wouldn't have to push so hard, and it might perk up and see the world clearly, though inverted. I saw things clearly myself in those days. Some deep thinker would write in, very sarcastically, that surely I meant a bat, not a wombat, and I would zing back "Dear Batty, You hang out with your friends and I'll hang out with mine, and we'll see whose ears drop off first."

Answers just weren't a problem. The raw fish sufferer I advised to send out for pizza. Sure, by now you've heard the pizza cure for rotten service and bad food, maybe from a joke-telling cheerful Charlie on late-night television. Probably you've seen it happen in what might loosely be called real life: some citizen waits an hour for a dried-out arrangement of animal and plant fiber that will cost him $32, plus tip. He makes a phone call, and 15 minutes later the Domino's man trots into the restaurant and delivers. Extra sauce, pepperoni, and a screaming headwaiter, what more could you ask? An answer and a half, and I had it first.

I even had an answer for the income tax. Make the IRS unprofitable, I told my fans. Overpay your tax by some small amount, such as $3.67. Then, eventually, when you get your $3.67 refund, send back another letter thanking the federal woodchucks, but saying that recalculation makes it appear that you really do owe money. Enclose a check for $6.40. It costs the government $825 in computer time and salaries to refigure your return and send a check. If millions of civic-minded citizens overpay relentlessly, the Treasury Department will go broke, retire and grow roses, like any other elderly robber baron.

It was the New Age cult ("No, not cult," says my wife, the Answer Woman, with a smile of sweet patience) . . . OK, it was the New Age shamanistic enlightenment ("You're just sticking out your tongue and going 'nyah-nyah,'" says she) . . . All right, then, it was that gaga Shirley MacLaine and her flea-brained reincarnation ("Channeling," says the voice of reason) that curdled the Answer Man business, which up to then—as I used to tell my student answer men at the community college—had been the best scam since orthodontia, requiring only minutes of thought a week and no stoop labor.

What happened was, some fuddled husband wrote in needing help. "My wife says that she used to be Cleopatra in a past life and I used to be a water buffalo," said this Old Age hubby. "But her girlfriend Clarice also used to be Cleopatra. Are they nuts or am I?"

I should have told him to have a shot and a beer, and then get into a good, meaty argument with the guy on the next stool about whether the Seattle Kingdome or that tin can the Minnesota Twins play in is the worst ballpark in the majors. But I take my Answer Man oath seriously. "Remember you are right, then go ahead," says the diploma on my office wall.

So I went ahead. "Channeling experts confirm that in the U.S. alone 17,283 women were actually Cleopatra in former lives," I wrote. "Oddly enough, however, neither your wife nor Clarice is among them. On the other hand, it appears certain that you really were a water buffalo."

"Not funny," said the Answer Woman as we ate supper. "That poor sap isn't the only water buffalo around."

"Sure, sure," said I. "But if all of those women really were Cleopatra, her unconscious must have sounded like high noon at a vegetarian restaurant in Santa Monica. How come nobody ever emptied slop jars in former lives?"

"Channelers are way ahead of you. Having been a beautiful serving wench in a past existence is now very popular."

"Bosh and double-bosh. Channeling is the spiritual equivalent of tofu."

"You're just closed-minded."

"Yeah, well, if you don't close the windows the bugs fly in. Like that dame on the West Coast who claims to be some kind of human megaphone for a 40,000-year-old Neanderthal condo salesman named Gronk. A complete fraud, of course. The guy who is talking through her is a bankrupt harness repairman named McCaffrey, from Linwood, New Jersey, who died in 1906. He was a loser then, and being dead hasn't made him any smarter."

"If you say so," said the Answer Woman.

"No question about it. What's this we're eating?"

"Tofu casserole. It was roast beef in a past existence, and you must have been Henry VIII, because you're on your third helping."

I am working on my answer. In the meantime, if you call my number, you will get the answering machine.

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